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THE AGARICACEAE

OF

MICHIGAN

C. H. KAUFFMAN

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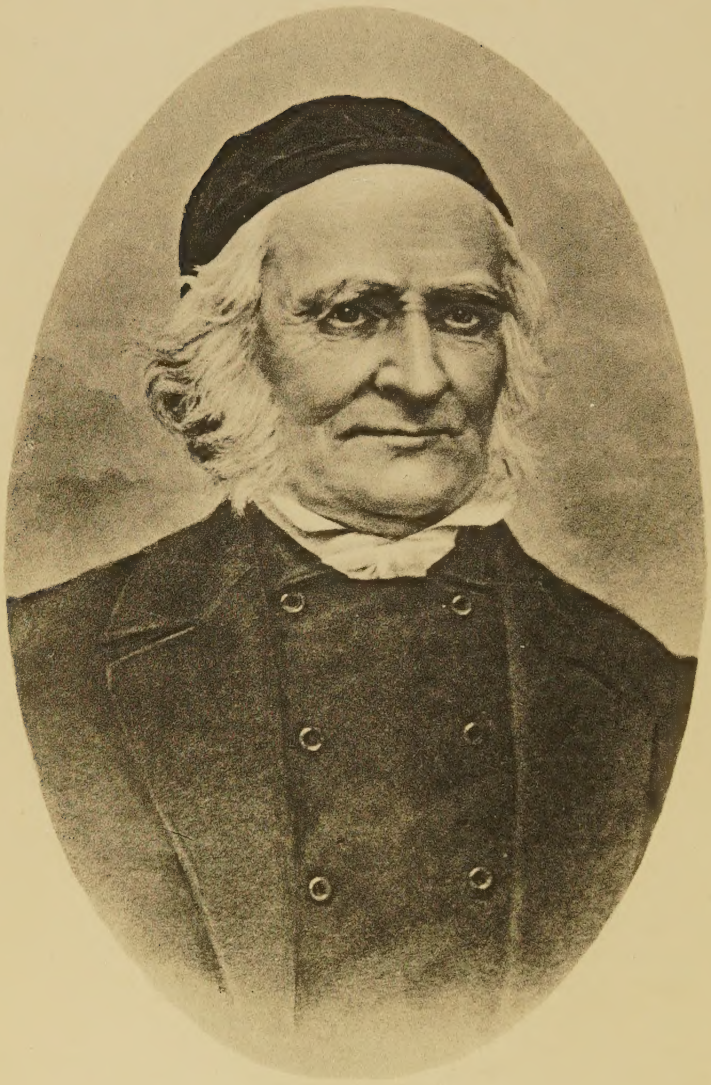

ELIAS MAGNUS FRIES

Cockayne—Boston

MICHIGAN GEOLOGICAL AND BIOLOGICAL SURVEY

Publication 26

Biological Series 5

THE AGARICACEAE OF MICHIGAN

BY

C. H. KAUFFMAN

VOL. I

TEXT

PUBLISHED AS A PART OF THE ANNUAL REPORT OF THE BOARD OF GEOLOGICAL AND BIOLOGICAL SURVEY FOR 1918.

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1918

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LETTERS OF TRANSMITTAL.

To the Honorable the Board of Geological and Biological Survey of the State of Michigan:

Gov. Albert E. Sleeper.
Hon. Frank L. Cody.
Hon. Fred L. Keeler.

Gentlemen:—I have the honor to transmit herewith the manuscript and illustrations of a treatise on the Agaricaceae of Michigan by Dr. C. H. Kauffman with the recommendation that it be printed and bound as Publication 26, Biological Series 5, in two volumes.

Respectfully yours,

R. C. ALLEN,

Lansing, Michigan, February 10, 1918. *Director.*

Ann Arbor, Michigan,

Sir:—I submit herewith a monographic report on the Agaricaceae of Michigan by Dr. C. H. Kauffman. This monograph is the result of field and laboratory studies made by Dr. Kauffman during the past ten years, and its object is to summarize what is known of the occurrence and characteristics of the species which have been found in the State. It should be of service to students and teachers of botany, to mycologists, and to persons interested in fungi as food. The report is to be considered as an addition to the series of monographs on Michigan plants and animals which the Survey is having prepared.

Very respectfully,

ALEXANDER G. RUTHVEN,

Chief Naturalist.

R. C. ALLEN, Director,
Michigan Geological and Biological Survey.

PREFACE

This report is the result of a series of surveys initiated in the summer of 1906. During that season the shore of Lake Superior was visited at six points: Sault Ste. Marie, Munising, Marquette, Huron Mountain, Houghton and Isle Royale at Washington Island. In the summer of 1905 the region around Bay View in Emmet County was well covered in an independent study and these results are also incorporated. During 1907, 1908 and 1909, the flora of Ann Arbor, Jackson, Detroit and neighboring regions was studied. In 1910, 1911, 1912 and 1913, portions of the summers were spent at New Richmond, Allegan County. Brief trips were made to other points in the State; to Negaunee, Alpena, South Haven, etc, but due to dryness or to the time of year, comparatively little material was obtained. At all these places a considerable area was covered so as to include all possible habitats.

The purpose of the report is primarily to afford the people of Michigan a comprehensive account of the Agaric flora of the State. The extended study necessary to determine the material soon showed the need of critical notes for many species. Hence the report has developed into a manual of considerable size since it seemed worth while to include a large amount of general as well as scientific information, such as is widely scattered in books and journals and is not accessible to most readers. There resulted a two-fold arrangement of the commentary under the different species: first, an effort to simplify the identification of a species through suggestive comparisons and data of interest not given in the formal descriptions; second, critical discussions, from a more purely scientific standpoint, intended for advanced students and mycologists. Many species, especially those of small size and for which a microscope is essential for identification, have been discussed in the notes solely for the specialist. But every effort has been made to clarify the descriptions of the larger mushrooms to the advantage of the beginner.

All descriptions of species not in quotation marks were drawn from fresh plants collected in most cases by myself or sent to me immediately after picking. *The reported spore-measurements of all such,* except a few where noted, *have been made by me* and all

errors are therefore to be laid at my door; the same is true of the other microscopical details. Outside of the list of species reported by Longyear, nearly all of which I have collected also, few Michigan species which I have not seen in fresh condition have been included. It seemed safer not to rely on oral information as to the occurrence of a particular species. All available literature was used in the final determinations and the fresh specimens were compared carefully with the original descriptions of Peck and with those discussed in the works of Fries and many other mycologists. Most of the important works were taken along wherever collecting was done away from Ann Arbor, and besides this full descriptions and notes were written on the day on which the specimens were found. Usually sketches or colored drawings were also made of the fresh plants. In many cases photographs were obtained although this was not always feasible. The microscope was constantly at hand and spore-measurements were made on the day of collecting.

The descriptions of many authors are often very incomplete. Spore-size, presence or absence of cystidia, odor, taste, width or closeness of gills, and many other characters are often lacking. An attempt has been made to complete all descriptions so that the student may have a means to make full comparisons between species of a genus. I have found it very discouraging at times to find the one decisive character in a description lacking; in such cases it often becomes necessary to look through many books for the information wanted. No one can be more fully aware than I of the pitfalls lurking in such an attempt to emend the traditional descriptions. It seemed to me, however, that the errors which may have resulted from a wrong interpretation of some species were far outweighed by the information added to the many others. The principal claim for the descriptions is that they are relatively complete and accurate for the plants found in Michigan and that they were drawn from fresh material.

The work on the genus Coprinus has been done by Dr. L. H. Pennington for which I make grateful acknowledgment. That this difficult genus has been properly represented is entirely due to his efforts. Many of the species were cultivated by him in the laboratory and are strikingly shown in his photographs. The work was started while Dr. Pennington was still at the University of Michigan.

The genus Cortinarius has been included in the form of a preliminary monograph of the species of the eastern United States.

Experience has shown that it is scarcely wise at present to refer more than a few to synonomy because of the large number of species. Hence I have included the descriptions of those American species which I have not yet seen, placing them in quotations. The species found in the State can be easily separated by the locality given.

Throughout the work on this report I have been indebted to many individuals for help in identification, for specimens and for sympathy and encouragement. From Dr. Charles H. Peck who has so long held out a helping hand to beginner and specialist alike, I have received abundant and unstinted help. To Professor Geo. F. Atkinson I owe the foundation which has made the work possible. For their many favors I am deeply grateful. For material and suggestions I am also indebted to Dr. W. G. Farlow, Dr. R. A. Harper, Dr. C. E. Bessey, Dr. L. H. Pennington, Dr. L. L. Hubbard, Lars Romell and a number of others. To Dr. O. E. Fischer and Mrs. T. A. Cahn of the Detroit Institute of Science I am much indebted for abundant and excellent specimens, and especially to Dr. Fischer for the use of some photographs and for the chapter on Toxicology. Miss Rose Taylor made many collections at Negaunee.

I also wish to thank here those of my colleagues of the various departments of the University for their sympathy and interest and especially those officials who have so generously supplied the University library with the necessary books and plates for the special purpose of furthering this study; and also the staff of the Geological and Biological Survey, especially Dr. A. G. Ruthven, for their patience and encouragement during the long drawn out progress of the work. Grateful recognition is due to my wife for a helping hand in much of the detail work in caring for material, assistance in collecting and in the reading of the manuscript.

The photographs were taken and prepared throughout by myself except those obtained from Dr. Fischer. An effort was made to illustrate as many as possible of the plants not before illustrated. For all other plants full sets of references will provide the student with the means of comparison.

Cryptogamic Herbarium, University of Michigan, April 1, 1915.

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THE AGARICACEAE OF MICHIGAN

C. H. KAUFFMAN

GENERAL INTRODUCTION

THE STRUCTURE OF AGARICS

An Agaric is a plant which, considered morphologically and physiologically, is composed of two portions: the vegetative, called the *mycelium*; the reproductive, called the *fruit-body* or *carpophore.*

The Mycelium

When a spore, derived from the gills of a fruit-body, germinates it forms a protuberance on one or more sides; this elongates into the form of a filament, always growing at the apex and usually branching abundantly, so that finally a weft or mass of such becomes visible, even to the naked eye. The filaments thus formed are referred to as *hyphae,* or collectively as *mycelium.* In diameter they vary from 3 to 6 thousandths of a millimetre and singly can be seen only with the microscope. Cross-partitions are numerous and the separate divisions are the ultimate units of structure, i. e., the cells. Such mycelium is widely distributed in the soil, humus, decaying wood, etc., and once established is doubtless perennial, so that new supplies from spores are probably less common than ordinarily supposed. It absorbs its food directly through the delicate cell-walls and the interior of each cell is thoroughly saturated with water. It appears capable of withstanding considerable drying, perhaps for long periods, reviving and renewing its growth after receiving a new supply of moisture. In some cases the mycelium twines itself into strands which become dark colored and tough and which are spoken of as *rhizomorphs*; or minute tuber-like masses may be formed, termed *sclerotia.* These evidently also serve as a resting stage during dry weather. The mycelium is usually hyaline under the microscope, but massed together appears whitish to the eye; it may also have other colors, green, blue, red, yellow, etc., but these are not very common. When growing luxuriantly in artificial beds of manure it becomes the "spawn" of commercial mushroom growers. Methods are now in use in laboratories, by which many kinds of spores are germinated and the mycelium grown in pure cultures; the "spawn" obtained in this way is called "pure culture spawn."

The distribution of the mycelium in an undisturbed soil, as for

example, in a park, lawn, fallow field, roadside or in woods, may be considerable, extending underground for rods, so that the size of the plant in the vegetative stage, in a linear sense, is quite large. Under such permanent conditions, quite a number of species form "fairy rings" when they fruit. The mycelium is started at one point and if the soil is favorably homogeneous in every direction, growth continues radially from the original point and at the circumference of this patch of mycelium, where growth activity is greatest, the fruit-bodies appear each year. In one case a "ring" with a diameter of 65 feet was observed by MacQuan in Africa. (Grevillea, 1880-1881.) The appearance of the fruit-bodies of some species "in troops" is usually due to the fact that only one arc of the circle is left. In the forest, obstacles are too numerous so that the "ring" does not remain perfect and the fruit-bodies appear scattered promiscously. Observations made in a clean forest in Europe for a period of ten years showed that the "ring" of some forest species traveled radially for several rods but the periphery at length became obscure. The mycelium of many species doubtless is more affected by irregularities in the food supply and hence grows in an unequal manner, or produces such few fruit-bodies that the radial growth does not show. Doubtless also where there are scores of different kinds growing in a small area they intertwine or interfere with each other. During continued wet weather the compressed masses of fallen leaves in frondose woods are often found to harbor patches or sheets of mycelium of many species, which are easily observed by removing the top layers of leaves and which are a forerunner of a good crop of fruit-bodies if the humidity is maintained. Curious sheets of mycelium, of the appearance of sheets of paper, are sometimes found between planks or other piled up lumber, but these usually belong to the Polypore group of fungi.

The Fruit Body

The fruit-body, or carpophore, is the portion popularly referred to as *the mushroom,* but it must be remembered that it is only a temporary product of the plant as a whole, just as is the apple of the tree which bears it. It is usually composed of the *pileus* or cap, *lamellae* or gills, and a *stipe* or stem; in the genera Amanita, Amanitopsis and Volvaria there is present in addition a *universal veil* which breaks away and forms a volva on the stem. In Amanita, Lepiota, Armillaria, Pholiota, Cortinarius, Stropharia, Chamaeota and slightly in a few other genera, there is found a *partial veil,*

which on breaking away may form an *annulus* in some of these. For details see the introduction to these genera. The essential parts are the *gills* and *pileus* and these are present in every species described in this book; the stem, however, is also usually present and such a fruit-body is a typical Agaric. The tissue of the fruit-body is primarily an aggregation of hyphae, and hence merely an extension of the mycelium, compacted to form a specialized structure. When a portion of the pileus is cut radially, or of the stem longitudinally, and magnified with the microscope, it is seen that these are merely masses of parallel or interwoven hyphae composed of cells, very similar to those of the mycelium. Some of it is specialized to be sure, as is the cuticle of the pileus or stem; sometimes portions are gelatinous, others hardened or encrusted, but this is more evident in the mature plant. The tiny beginnings of the mushroom are composed of much the same kind of hyphae throughout.

The Pileus

The pileus is essential in that it bears the gills. There are only a few known species in which the gills radiate out from the top of the stem minus any cap, and these constitute the rare genus Montagnites, none of which are known in our state. The principal parts of the pileus are the surface layer, the margin, and the flesh or *trama.* For the many variations of the structure and form of these it is necessary to consult the glossary. (See also Fig. 1.) The trama may however, be briefly considered: in the young, fresh or actively developing fruit-body the hyphae of the trama are usually compact and appear like actual filaments, but as it approaches maturity the hyphae varies. In some, e. g., Coprini, the cells of the hyphae quickly loosen from each other and become rounded, and the whole pileus, if not quickly dried by the wind, collapses. Others are less evanescent and in these the tramal hyphae, although loosened considerably, support the pileus for some days. Many of the larger forms, e. g., Tricholomas, retain their compact form for a long time, and in tough species like Lentinus the hyphae of the trama appear to retain their close-lying position unchanged. The trama of the Lactariae is unique and is described under that group. Many of the smaller Agarics like Mycenas and Galeras have comparatively few layers of hyphae, often of very large cells.

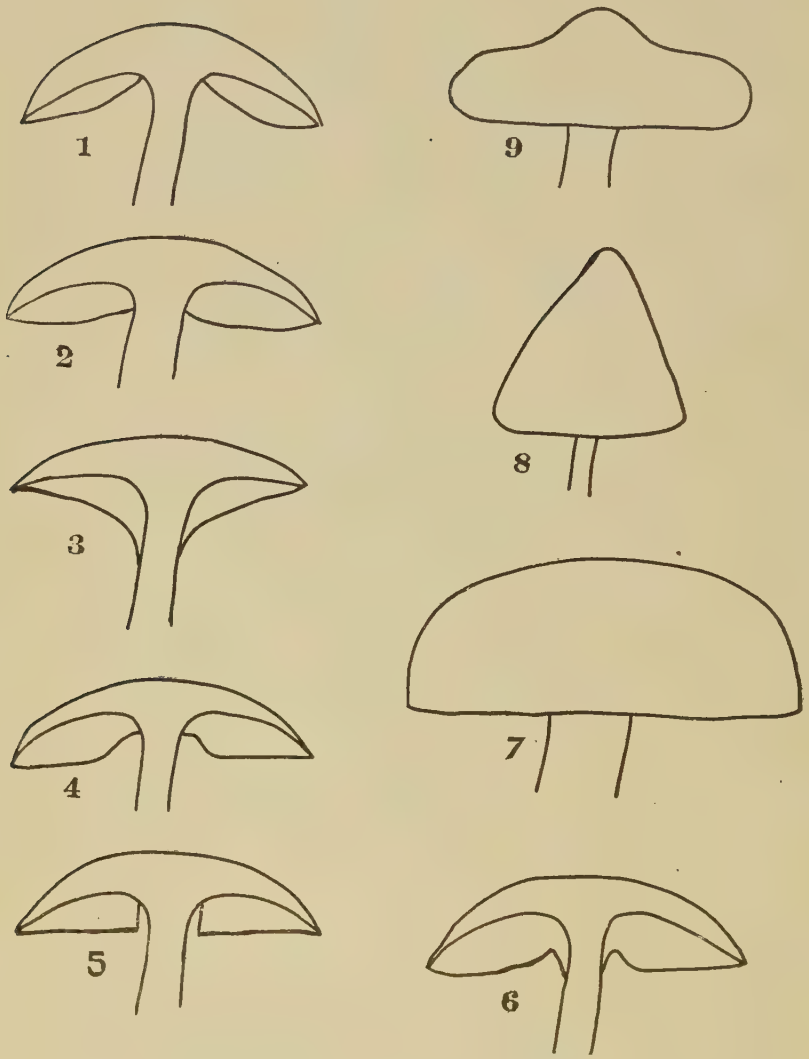

Figure 1.—Structure of Agarics: (1) Gills free; (2) Gills adnate; (3) Gills decurrent; (4) Gills adnexed; (5) Gills seceding; (6) Gills emarginate and uncinate; (7) Pileus convex; (8) Pileus conical; (9) Pileus campanulate.

The Gills

Underneath the pileus the gills are attached in the form of knife-blades collectively called the *hymenophore.* Gravity appears to be responsible for their position on the lower side. Rarely one finds an outgrowth of an abnormal character on the top of the pileus, sometimes in the form of a second mushroom of the same kind with or without a stem, sometimes with the gills growing upward from a small area of the main cap. The latter case has never been satisfactorily explained. The gills are of course attached all along their thicker edge to the pileus. They may be attached to the stem at their inner end, also called the posterior end or base; or they may be free, i. e., not reaching the stem or at least not attached. The manner of attachment is shown in Fig. 1, 1-6, as adnexed, adnate or decurrent. These are important characters for the separation of genera. In some cases all the gills extend from the margin of the pileus to the stem, in many, however, they are dimidiate or with very short gills at the margin of the pileus. The spacing of the gills is quite important, but considerable variation occurs in the same species; only relative terms seem usable: crowded, close, subdistant and distant. The same may be said of their width.

It is very important to understand their structure. Here a microscope is necessary. A section cut tangentially across the pileus and gills will show a good view of the appearance of the trama, etc., of each lamella. The interior is again composed of hyphae and in such a section they lie either parallel, converging along the median axis, diverging, or interwoven irregularly. In all cases this is the gill-trama and is bordered by the hymenium.

The Hymenium (See Fig. 2, 1.)

The border which extends over the whole surface on both sides of the gills is the hymenium. While the hyphae may lie in a general way parallel to the axis of our section, the large club-shaped cells which form the border extend outward at right angles to this axis and form a sort of nap like that of a Brussel's carpet. These large cells are the *basidia,* (singular, *basidium*), and at its apex, as seen in the figure, each basidium bears typically four *spores;* rarely it may develop only two spores or even three. Each spore is attached by a minute stalk called the *sterigma,* (plural, *sterigmata*). The basidia are in turn continuations of the hyphal filaments which compose the trama of the gills. Often there is a slight specialization

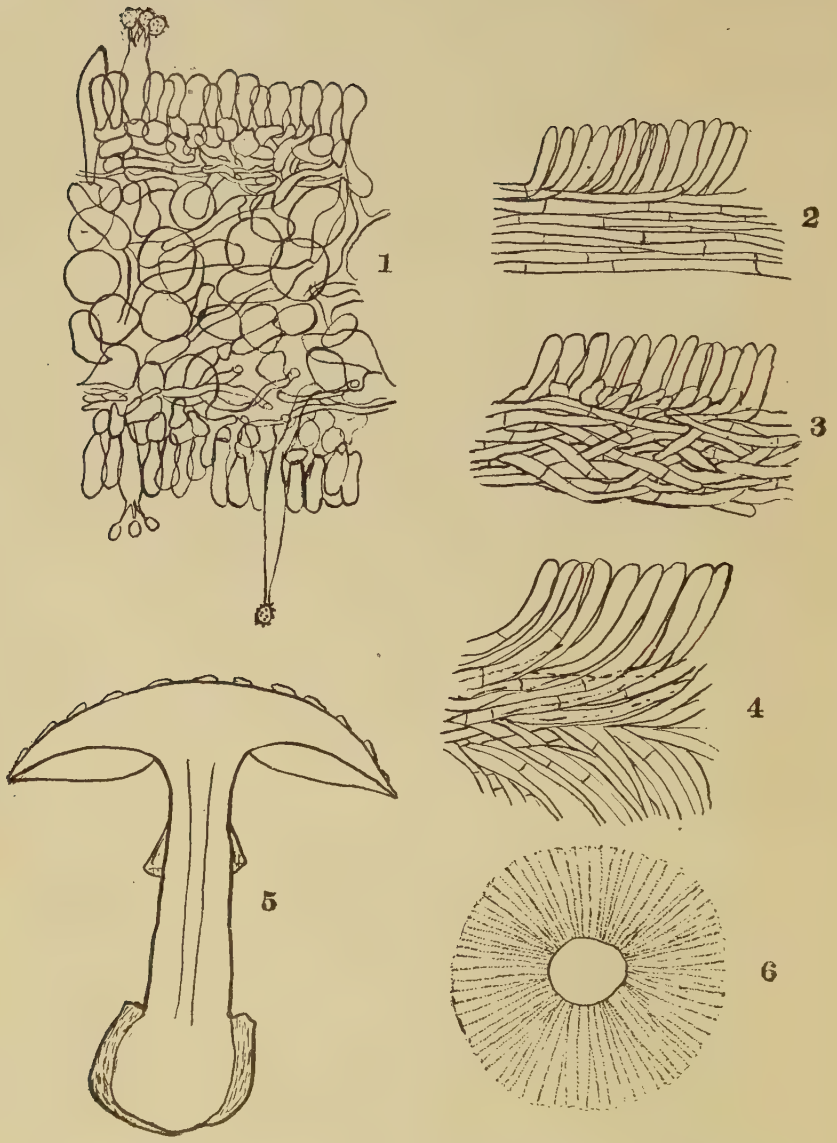

Figure 2.—Structure of Agarics: (1) Vesicular trama of a section through a gill of a Russula, showing also the hymenium, basidia, and a cystidium (adapted from Fayod); (2) Parallel gill-trama-diagramatic; (3) Interwoven gill-trama diagramatic; (4) Divergent gill-trama diagramatic; (5)Section of Amanita, showing volva, annullus and scales on the pileus.

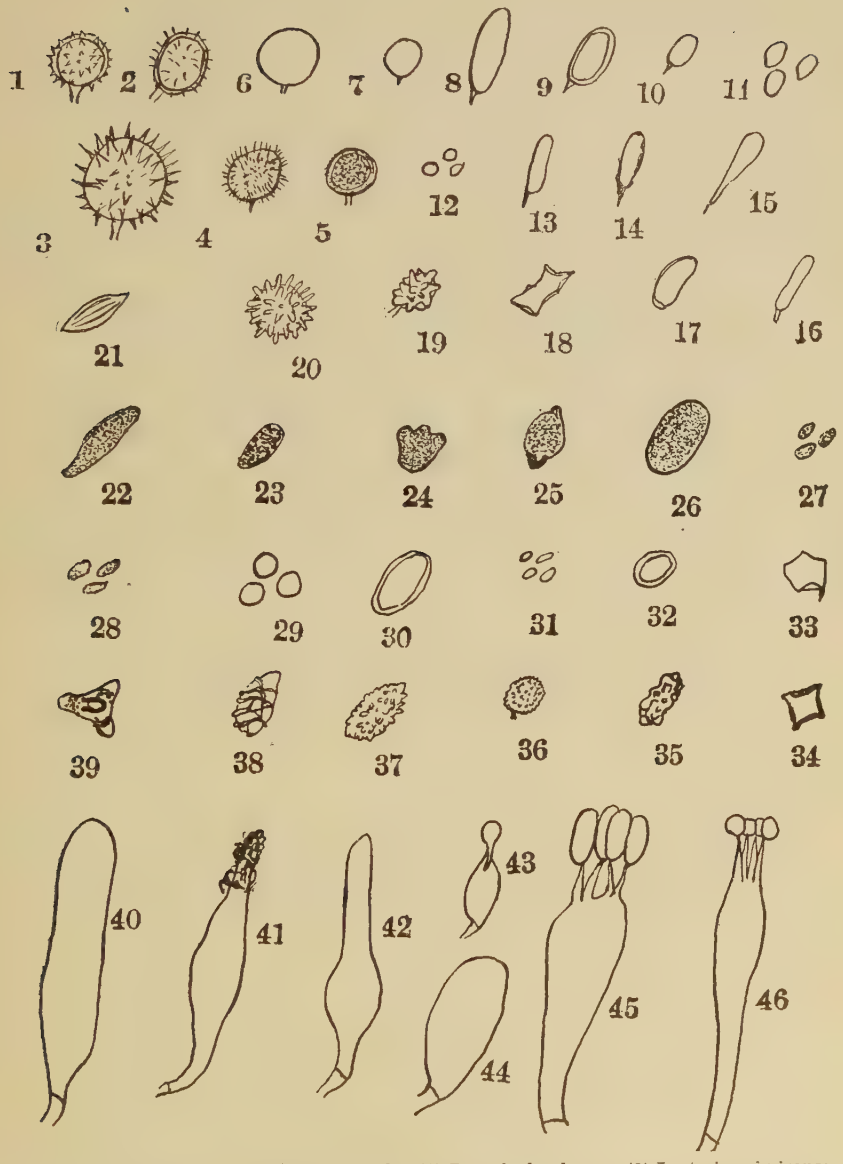

Figure 3.—Types of spores drawn to scale: (1) Russula decolorans; (2) Lactarius nigricans; (3) Lactarius tortilis; (4) Inocybe galliardi; (5) Coprinus sp.; (6) Amanita porphyria; (7) Trichloma laterarium; (8) Amanita peckianium; (9) Lepiota procera; (10) Lepiota naucina; (11) Tricholoma equestre; (12) Tricholoma nobile; (13) Cantherellus clavatus; (14) Hygrophorus subborealis; (15) Marasmius sicus; (16) Inocybe infelix; (17) Inocybe caesariata; (18) Inocybe decipientoides; (19) Inocybe leptophylla; (20) Inocybe calospora; (21) Clitopilus prunulus; (22) Gomphidius maculatus; (23) Coprinus atramentarius; (24) Coprinus boudieri; (25) Hypholoma rugocephalum; (26) Coprinus sterquillinus; (27) Hypholoma hydrophilum; (28) Psalliota arvensis; (29) Cropidotus putrigenus; (30) Pluteolus coprophilus; (31) Pholiota flammans; (32) Plueteus cervinus; (33) Entoloma clypeatum; (34) Entoloma cuspicatum; (35) Noleana dystales; (36) Cortinarius annulatus; (37) Cortinarius atkinsonianus; (38) type of reticulated spore; (39) Heliomyces nigripes; (40-44) Cystidia; (45-46) Basidia.

of the hyphae just inside the hymenial layer termed the *subhymenium.*

The hymenium may include, along with the basidia, cells of other shapes or functions; the *cystidia* (singular, *cystidium*), (see Fig. 3, 40-44) are elongated, cells fusiform, lanceolate or have various shapes according to the species, and project at maturity above the basidia. Their function apparently is to aid in the exudation of water from the plants. (F. Knoll, Jahrb. Vol. 50, p. 453.) The presence or absence of *cystidia* is much used to identify certain species. The observations must be carefully made, however, since they quickly collapse at maturity in some cases, and in others do not elongate until full maturity of the mushroom. They occur more or less scattered over the surface of the gills and are often tipped with oxalate of lime crystals. Also, they may occur on the edge of the gills and give this a minutely flocculose or fimbriate appearance. More frequently the edge is provided with elongated *sterile cells* of various shapes which produce the same effect as cystidia. In this work these are the only "sterile cells" referred to in the descriptions.

The spores vary in size, shape, color, structure of surface, etc., and are fully discussed under each group. (See Fig. 3, 1-34.)

The *stem, volva* and *annulus* are also described under each genus possessing them.

HABITAT AND GROWTH CONDITIONS OF THE AGARICS

The Agarics, like all fungi, are either saprophytic or parasitic. They are dependent on organic matter for a large part of their food; this is due to the absence of chlorophyll which makes them incapable of manufacturing carbon-compounds from the air. As saprophytes they occur on a great variety of substrata; soil, humus, dung, wood, fallen leaves, bank, straw, dead animal remains, decaying fungi and forest debris of all sorts. They can even be cultivated in the laboratory on gelatine and agar with proper addition of sugars, etc. As parasites they are found on living trees or shrubs, rarely on herbs. They are often attached to the rootlets of trees and shrubs on which they cause formation of *mycorhiza*; some consider this relation a parasitic one.

The fleshy fungi are most abundant in woods and forests and hence are largely dependent upon the character of the forest. When the woods are cleaned or the forest cut down, there is often quite a change in the flora of such a place after a few years. In

addition to the proper food supply for their growth, moisture and temperature are the two most important factors for the rapid development of the fungi. The fruit-bodies of mushrooms contain a very high proportion of water, varying between 70 and 95 per cent according to species, weather conditions, age of plant, etc. The mycelium is also composed of much water which fills the vacuoles not occupied by the protoplasm. In spite of this fact, a far greater number of species occur in the upland forest than in wet swamps or marshes. It appears as if either some unfavorable soil content of a poisonous nature or too great an abundance of water prevents the mycelium of many species from growing in low wet places or at least prevents them from fruiting. Only certain kinds grow in marsh soil; although where there is an abundance of brush, logs or debris which can be used for support the moist surroundings are very favorable to forms which prefer such substrata. The largest number of species are found in forest hillsides, ravines, etc., where there is a clay sub-soil or where the forest floor is covered with sufficient humus, dead leaves, thick moss or other debris to hold the moisture. With the moisture content neither too large nor too small in such situations and where severe drying out is prevented, it would appear that the mycelium can vegetate luxuriantly, and after rains, especially long continued rains, the fruit-bodies or "mushrooms" form abundantly.

The temperature must also be favorable for each species. Warm or "muggy" weather, continued for several weeks with accompanying rains, usually causes the woods and fields to bring forth a good crop of mushrooms during July and August. Later, in September and October, an entirely different group of species appears, often in relatively cool weather; and some species often appear after the first frosts, always provided that the soil has been previously moist enough for the mycelium to vegetate sufficiently. Romell (Hymen of Lapland), reports that Agarics were abundant near the tree-line, and even in the region along the tree limit right up to the line of perpetual snow. This would indicate that for some species temperature is not so important as moisture, although growers of mushrooms in artificial beds in cellars, etc., find the temperature a very critical factor.

It must be remembered that time is also an element. After a drought it may take several weeks of steady rains before the fruit-bodies appear above ground. Rotten wood and logs retain the moisture and a single rain is often sufficient to induce growth. A single heavy rain or even a number of scattered showers, if too far

apart, are not sufficient to produce a crop outdoors. The exact combination of temperature, time and moisture necessary is hard to calculate with certainty even after much experience. The mycelium must be sufficiently well developed before it has enough energy to produce fruit-bodies and this development is often slow for reasons not clear to the collector. Every field student of mushrooms knows that there are "good" collecting grounds and poor collecting places. The conditions mentioned above are probably responsible in large part and yet very similar fields or woods may be exceedingly unlike in the number and abundance of forms which are found in them Just why this is so is not understood.

The species which grow on living trees are many. The most prominent are here given:

Armillaria mellea. (On roots of living trees.)
Armillaria corticatus. (Hickory, maple.)
Collybia velutipes. (Willow, birch, oak, alder, elm, poplar, etc.)
Pholiota adiposa. (Maple, oak, ash, etc.)
Pholiota albocrenulata. (Maple, birch and hemlock.)
Pholiota destruens. (Yellow birch, willow.)
Pholiota spectabilis. (Birch, oak, etc.)
Pholiota squarrusoides. (Maple, birch, beech.)
Pholiota squarrosa. (Birch, beech, willow, poplar, alder, etc., in Europe.)
Pleurotus applicatus. (Maple, poplar, birch, etc.)
Pleurotus atrocuerulius. (Mountain ash, sorbus, etc.)
Pleurotus ostreatus. (Willow, birch, basswood, beech, oak, walnut, locust, etc.)
Pleurotus sapidus. (Similar to *ostreatus.*)
Pleurotus subareolatus. (Maple, basswood.)
Pleurotus ulmarius. (Maple, elm, basswood, hickory, etc.)
Volvaria bombycina. (Maple, beech, elm, horse-chestnut, etc.)

These species are probably all capable of some degree of parasitism, i. e., can affect living tissue. Direct evidence as to the extent of this power in each species is hard to get. The spores probably effect an entrance at a wound, the plant first growing on the dead tissue at the wound, then pushing through the heartwood which becomes rotten as a result and finally affecting the sapwood and cambium and so injuring the vitality of the tree. Even if not killed by the fungus, the decayed interior is a source of mechanical weakness and the tree is eventually blown down by storms.

The rotting of cut or structural timber by the mycelium of some Agarics is perhaps equally important. Bridge timbers, railroad ties and even house timbers may be attacked. *Pholiota aeruginosa* is perhaps a much greater enemy of railroad ties than the rare occurrence of its fruit-body would indicate. *Lentinus lepideus* has long been known as a destructive agent to all sorts of timber. Firewood left in the woods in moist situations, even if piled up, may be attacked by a great variety of the smaller Agarics. There can be no doubt that fungi of all sorts, including Agarics, are extensive agents of decay and are much more effective than bacteria in bringing about the disintegration of dead vegetable matter and thus returning it to the soil; it is only in the later stages of decay that the bacteria play the greater role.

Agarics may show a decided preference for a certain substratum, e. g., kind of wood, kind of dung, kind of leaves, etc., on which they grow. Some are sharply limited to coniferous wood and are never found on wood of broad-leaved trees. Others seem to thrive well on a great variety of substrata. A few are parasitic on other mushrooms. (See Nyctalis.) The field mushroom *Psalliota arvensis* and the common mushroom *Psalliota campestris* are scarcely ever found in the woods, just as *Cortinarius armillatus* is never found in the field. Some consider that the soil is here the controlling factor. It must be remembered, however, that it is decaying vegetable food, which is the foundation of the subsistance of the mushroom, and the presence of barnyard manure or the fact that sheep have pastured in a field is after all more effective than the mineral content. This question is not yet settled and French mycologists lay quite a little stress on the mineral content of the soil, insisting that calcareous soil and clay soil are the homes of different species. With regard to Michigan species, the data are not sufficiently clear.

THE DISTRIBUTION OF AGARICS IN MICHIGAN

Any attempt to give a definite account at the present time of the distribution of species in the state is fraught with difficulties. Many localities have not been visited, and only a prolonged study of a locality reveals an approximation of the species occurring there. The very fascination of the search for fungi consists in their sporadic appearance. The species appearing one season may be absent the next. Some species fruit apparently only at long intervals; others only under special weather conditions.

The principal points in the state around which sufficient collect-

ing has been done to be of any use in such a summary are shown on the accompanying map. By far the largest part of the material of this report has been collected by myself, assisted at Ann Arbor by some of my students. Entire seasons have been spent at Ann

Figure 4.—Map of Michigan showing centers of principal collecting areas.

Arbor, New Richmond, Bay View and along the shore of Lake Superior and the flora of these regions is now partly known. The activity of members of the Detroit Mycological Club has resulted in a good survey of the region around Detroit. Between the years 1896-1903, Longyear and his co-workers studied the flora of East Lansing, and also obtained material from Greenville, Chatham

and other points. A few species have been received from isolated points but usually such are common and of wide distribution. The main central portion of the Southern Peninsula north of latitude 43° has not been touched; and from the iron-bearing regions of the northern Peninsula there are no records. Isle Royale was visited in a dry season and there were few important finds. Houghton, Marquette, Munising and Sault Ste. Marie were the centers of one season's extensive collecting and we have a fair idea of their summer flora; concerning the many autumn species which assuredly grow in the coniferous regions of the northern half of the state, we have little information, as most students and collectors must return to their school duties before October.

The principal species of field and lawn seem to be equally distributed throughout the state; here may be mentioned *Psalliota campestris* and *Psalliota arvensis, Marasmius oreades, Psilocybe foenesicii, Lepiota naucina* and the Coprini. It appears that *Lepiota Morgani* begins to disappear in the latitude of Lansing; that *Amanita caesarea* scarcely enters our southern border. The species which grow only on distinctly sandy soil are apparently distributed throughout the sandy regions of the state although in many cases the records are not complete; for example, *Amanita russuloides* and *Amanita spreta* have been found only at New Richmond whereas *Russula delica* is abundant in sand under copses and groves all along the Great Lakes, but less abundant in the interior of the state. Many species doubtless prefer a clay soil and are distributed accordingly. By far the larger number of species are, however, dependent for their distribution on the character of the forest. This is most sharply illustrated by the difference between the flora of the coniferous regions north of latitude 44° and along the eastern and western border of the state where conifers have existed in the past, and of the hardwood forests and woodlots of the southern portion. The genus Cortinarius is composed of seven large subgenera. Of these, the subgenera Bulbopodium and Phlegmacium have a large number of representatives in the hardwood region, but are poorly represented in the north; on the other hand, the subgenera Telamonia and Hydrocybe occur in large quantities in the coniferous regions. Whatever factors, therefore, influence distribution of conifers doubtless affect also the distribution of certain Agarics. It is much to be regretted that we have so little data concerning the original mushroom flora of the 15,000 square miles of the central portion of the Southern Peninsula once covered by white pine forests. The nearest approach to original conditions, recorded in

this report, was found by the exploration of the white pine lands around New Richmond. None of the virgin pine forest is left at this place, but second growth groves still yield characteristic fungus forms. Many of the sand plains at New Richmond remain uncultivated and are covered with scrub oak; here, however, the pine flora is no longer in evidence except as isolated species. Alternating with the sand plains are clay lands originally covered by hemlock and hardwoods. In the ravines bordering the river bottoms, there are still remnants of these forests and these yield a flora which is comparable with that of Bay View, Marquette, and wherever such forests exist. The flora of the tamarack bogs seems to be very similar throughout the state. In the tamarack bogs around Ann Arbor, we find the same species which are found in the northern bogs.

It is still an open question to what extent the formation of mycohiza may influence the distribution. If certain species can thrive only within reach of the roots of the beech tree for example, then those species are to be looked for only in beech woods. Evidence, however, is at hand to show that some species can form mycorhiza on a number of hosts. Every collector has experienced the feeling that many species growing on the ground in the woods are always to be looked for in the neighborhood of certain tree species. Perhaps collectors exaggerate this impression but in any case the subject needs clearing up. With regard to species found regularly occurring on wood, there is no doubt that they follow more or less the distribution of their specific substrata. In some cases, to be sure, a species may have a wide selection of material on which it can grow, and hence its distribution is not limited in such a manner. The species which have a parasitic tendency, like *Pleurotus ulmarius,* must have their distribution controlled to a large extent by the presence of the foster plant, although no Agaric which requires a living host at all times seems to be known with certainty.

COLLECTING AND PRESERVING AGARICS

For the Table

A basket, clean white tissue paper cut a foot square, a large pocket knife, a knowledge of mushrooms, favorable weather and the right place—these are the essentials. Of these the possession of accurate information is most important, since ignorance may mean sickness or death. If inexperienced and dependent on others for guidance,

proceed cautiously and do not become over-confident. Collect first in meadows, pastures and open grounds away from thickets and woods. Always take every part of a mushroom of which you wish to make a study. As soon as you have advanced sufficiently to be able to recognize different kinds always wrap up the species separately. If you are learning how to identify by means of this book, it will be well to run down and compare the description after every collecting trip so as to become versed in the meaning of terms and also as a check on the correctness of your own or others' opinions.

Avoid the genus Amanita. Also at the first avoid anything that appears to belong to the genera Entoloma, Tricholoma, Hebeloma and Inocybe. Avoid all which are no longer fresh and firm, or which have small burrows due to grubs. Avoid the large, colored forms until you are well advanced in the subject. All except Amanitas may be tasted without swallowing with entire safety; avoid all that have a powerful peppery or nauseous taste. Dr. Peck states that he has always found those with a taste of fresh meal (farinaceus) to be edible. Avoid the green-gilled Lepiota. Avoid those with a milky juice until you know a great deal about them.

Try the large white forms which grow on tree-trunks, *Pleurotus ostreatus, sapidus* and *ulmarius*. Try the meadow, field and street mushrooms: *Psalliota campestris, arvensis* and *rodmani*. Try the inky caps, *Coprinus micaceus, atramentarius* and *comatus*. From the woods, always after a thorough study, try *Russula virescens, Hygrophorus russula, Tricholoma personatum* and *nudum*. *Hygrophorus sordidus* and *Tricholoma resplendens* are two white mushrooms of excellent flavor, but beware of mixing them with the white Amanita. If you live among evergreen woods try *Cortinarius violaceus,* if in southern Michigan *Cortinarius michiganensis*. After a start is made, others, one at a time, should be thoroughly studied until finally every trip will yield a meal.

My advice to all beginners and amateurs is: *Collect and study the deadly Amanitas first.* I have found many people who had known and eaten a few kinds for a long time, who were entirely ignorant of any Amanita; such people are always in danger in spite of and often because of their self-confidence. Fatal poisoning does not infrequently occur to just such people.

The specimens should in all cases be carefully gone over again before cooking. An excess supply can be kept on ice for a day only. Samples from the basket can be laid overnight with gills down on

white paper and covered, so that the spore print may be used next day to check any error before cooking.

For the Herbarium

The fleshy Agarics may be placed in alcohol but if the container is much handled the specimen soon becomes mushy or crushed; if, however, it is carefully mounted and fastened on a glass plate and immersed in a stationary glass jar it may retain its shape a long time. The alcohol will dissolve the color and extract it. The best way to make a herbarium of these plants is to dry them on a square piece of wire-netting suspended over a kerosene or other flame. In this way the mushroom gradually dries without cooking or scorching. The color may or may not change and this fact itself is useful to distinguish between species. The dried specimens are very fragile and should be transferred for a day to a moist atmosphere where they will absorb moisture enough to become pliant. They can then be straightened or gently flattened but should not be pressed. Placed in a box with a proper label and a handful of naphthalene or moth balls they will last indefinitely. If beetles attack them they must be fumigated in a closed box with carbon-bisulphide; but if the naphthalene is constantly kept with the specimen the beetles seldom find their way thither. The use of boxes of varying size is much to be preferred to the method of pressing and mounting on sheets practiced by the older herbarium men. In either case, if specimens are very valuable beetles can be kept away with greater certainty by Peck's method of the use of strychnine. This is dissolved in warm water and sufficient alcohol added to enable one to spread the mixture easily.

Sulphate of strychnia	1/8 oz.
Warm water	5 oz.
Alcohol	about 2 oz.

Notes for the herbarium. Specimens dried and prepared as above are of little value unless they were correctly identified when fresh by a mycologist, or, in case they remain unidentified, they be accompanied by full notes of the characters in the fresh condition. The taking of good notes is in itself a sign of a trained mycologist. But amateurs can, by care and patience, sufficiently describe a plant so that the specialist can identify it. It is advisable that they follow an outline, of which many have been published. The better way

is to write a formal description, but if this is too difficult for the amateur the following outline may be used:

(If you wish the best attention from the specialist, do this part well. See glossary.)

LOCALITY.

DATE.

FINDER.

WEATHER.

HABITAT: ground, leaves, humus, woods, open grove, field, lawn, wood (kind), tree (kind), moss, dung (kind), etc.

HABIT: solitary, gregarious, cæspitose, subcæspitose, scattered, etc.

ODOR: farinaceous, pungent, nauseous, amygdaline, nitrous, earthy, mild or slight, etc.

TASTE: bitter, acrid, peppery, farinaceous, agreeable, mild or slight, etc.

PILEUS: *size. Shape when young;* conical, campanulate, acorn-shaped, cylindrical, convex, etc.

Shape when expanded: plane, convex, obtuse, umbonate, umbilicate, depressed, etc.

Surface: viscid, dry, hygrophanous, moist, glabrous, silky, fibrillose, virgate, floccose, tomentose, scaly (kind of scales as: loose, innate, erect, squarrose, pointed, fibrillose, large, superficial, appressed, etc.), even, rough, wrinkled, rugose, striate, furrowed, etc.

Margin: (when young), incurved, straight, inrolled, glabrous (when older), regular, irregular, wavy, tomentose, hairy, striate, rimose, etc.

Color: (when fresh and moist) (after lying a while). *Important.*

GILLS: *attachment:* adnate, adnexed, decurrent, uncinate, free, remote.

Width, relative to thickness of pileus, relative to species you know, or in millimeters.

Shape, linear, equal width throughout, ventricose, attenuated in front or behind, broadest in front, etc.

Spacing, (relative) crowded, close, subdistant, distinct, few.
Texture, waxy, deliquescent, dissolving, dry, arid, fleshy.
Variations, forked, crisped, veined, intervenose, anastomosing, dimidiate.
Edge, acute, obtuse and thick, serrate, eroded, entire, fimbriate, flocculose, wavy, etc.

COLOR: very important to give the color of the gills in the young plant, (e. g., Cortinarius, etc.), also when mature, after bruising or touching.

STEM: *size,* length, thickness above and below.
Shape, cylindrical, tapering up or down, bulb (clavate, rounded, marginate, or abruptly depressed, large or small), flexuous, straight, equal, ventricose, rooting.
Texture, fleshy, cartilaginous, tough, flaccid, brittle, flexible, fragile, spongy, fibrous, rigid, etc.
Interior, hollow, tubular, cavernous, stuffed by pith, solid, spongy, etc.
Surface, (see *Pileus.*)
Color, difference at base and apex, within and without after handling, etc.

FLESH OF PILEUS: *consistency:* rigid, compact, spongy, soft, brittle, etc.
Color: when moist, under cuticle.
Juice: taste and color, abundance, changing after exposure to air.

MYCELIUM: color, abundance.

UNIVERSAL VEIL in young specimens, method of rupturing.

VOLVA: size, texture, color, present, absent.

PARTIAL VEIL: in young specimens.

ANNULUS: texture, color, present, absent, fugacious, persistent, ample, slight, etc.

SPORES: color of spore print, drawing of spores, size.

CYSTIDIA: shape, abundance, present, absent.

SKETCH: a good sketch or diagram of plant or its parts.

REMARKS.

PHOTOGRAPHING AGARICS

Use a basket to collect for this purpose. It is well to have tin boxes, e. g., cocoa boxes, so that each specimen can be kept unharmed, wrapped separately in tissue paper and placed upright in the box. Amanitas especially become deformed or lose some of their surface tissue if not properly protected. The specimens can be set upright on decapitated pins in a row as in the photographs in this report. Natural size photographs are by far the best since comparisons are then easily made. For identification purposes such photographs are much more useful than those taken in the natural surroundings and reduced in size; the latter may be good pictures but are rarely helpful. Every part and every character used in a description that can be shown in a photograph ought to be brought out; to this end the specimens must be properly arranged and the details emphasized. Besides its value in this respect the photographing of Agarics yields much pleasure and entertainment.

THE CULTIVATION OF MUSHROOMS

The history of this business and the methods in use, whether on a commercial scale or for home use, have been so often described that the reader is referred to those works. The best and most complete account is to be found in Bulletin No. 85, Bureau of Plant Industry, U. S. Dept. of Agriculture, entitled: *The Principles of Mushroom Growing and Mushroom Spawn Making,* by Dr. B. M. Duggar. For other papers see Bibliography, part (d), and the mushroom books of Atkinson, Hard, McIlvaine, etc.

THE CLASSIFICATION OF AGARICS

The plant kingdom consists of two large groups; the seed-bearing plants or Phanerogams and the spore-forming plants or Cryptogams. The latter are sometimes referred to as "the lower plants" although they include also the large, tree-like ferns. The Cryptogams include the green plants like the Algae, Mosses and Ferns; they also include an enormous number of plants which do not possess the ordinary green color and these are the FUNGI. In the following outline of the fungi the grouping is given in a scientific manner, since this is the only arrangement sufficiently accurate. For the terms which are strange to the beginner, reference must be made to the glossary. Consistent perseverance and the use of elementary books on botany are the only self-helps that can be advised when one is first plunged into the subject. The best way to begin the study is by the help of a teacher or of a companion who is already somewhat informed and is enthusiastic enough to help others. Mycological clubs are of great value in this respect. This work treats only of a single one of the many families of Fungi, and for others the student is referred to the books dealing with the other groups.

The Keys

The arrangement of the species of each genus in the form of keys or synopses is entirely artificial and arbitrary; hence these keys are merely guide-boards to point the student in the right direction by the use of selected characteristics of each species. A specimen is not to be considered identified when it is "run down" in the key, but the name so obtained should be referred to in the text and the description of the plant carefully applied to the specimen in hand. Such keys cannot be constructed so as to be perfect since plants of this class are quite variable and one often finds specimens not at all typical and hence they do not fit into the key at the right place. An amateur should use the glossary constantly at first until the meanings of the terms become fixed. Many of these keys were tried out for years on fresh plants and continually revised and it is hoped they will seldom mislead very far. The keys are mostly dichotomous; starting on the left, the plant must agree, for example

with either (a) or (aa). This leads to (b) and (bb) or to the name of the plant. Sometimes the letters are tripled, etc., as (aaa), (aaaa). In that case there are three or more possibilities to choose from.

Arrangement of Species in the Text

The student will find, besides the keys, another means of identification. This is an arrangement in the text, by which the species which are the most closely related are grouped side by side. This is called a "natural classification" and is supposed to represent a relation according to the laws of evolution. Authorities differ on many points involved in such an arrangement, and hence it was necessary to follow, according to my best judgment, the order which appeared to be at the present time most acceptable. Our knowledge of many species is still too imperfect to expect any final arrangement. Furthermore, the number of species of such a small area of the world's surface as Michigan, is not representative of a like arrangement if applied to all the species of Agarics the world over. In view of this fact it seemed useless to try to be entirely consistent throughout the work. The genera are therefore subdivided in the way best adapted for each, although a general uniformity is approximated. The genera may be divided into subgenera and sections, and sometimes the sections are subdivided. In this way the most closely allied species are usually found together under the last subdivision.

Nomenclature

The rules of the International Botanical Congress held at Brussels in 1910, have been used (see Authorities and Abbreviations). Synonyms have been purposely omitted except in so far as they are mentioned in the commentaries. The study of synonymies is apt to become a "wild goose chase" and often offers nothing of importance for those who wish to become acquainted with the living plants; it is well adapted for those who prefer to make their mycological studies in the herbarium and library. There is little doubt that in the course of time, some of our American plants which were supposed to be different and were given names, will be found to be synonyms of European species. But there is no need of passing judgment on such till the evidence is all in. Undue haste in considering species identical has often brought about more error than existed in the first place. The field mycologist is constantly finding species which he had given up as hopeless synonyms, and much col-

lecting will make a mycologist cautious. A keen observer, like Dr. Peck, will often be quite certain of the distinctness of two species but fails in the description to make the distinction clear or strong enough to others. In such a case herbarium material may not show the facts and only the finding of fresh plants can settle the question.

The making of new species in haste is equally unfortunate. In the preparation of this work, scores of unidentified species accumulated, and many still remain unidentified. In many cases, however, the repeated finding of the same thing, often in better condition, perhaps with the necessary young stage, and further and better study on each occasion, resulted finally in its determination. Except in a few genera where I had made more extensive collections and a more exhaustive study, for example in Russula and Cortinarius, I felt it unwise to describe as new more than a few striking species. In spite of the accumulation of synonyms and the great possibility that more American species will end as synonyms, I believe that there are still quite a few Agarics in the United States which are unnamed. But it is hoped that such an expression of my view will not cause every amateur to give names to those he is unable to identify. In the recent German work of Ricken (Die Blätterpilze) over 1500 species of Agarics are given for Germany, Austria and Switzerland alone, and very few new species are included. This is a good example of conservatism with reference to the making of new species.

Credit has been given to Fries wherever possible in the use of names of European species, even where the species is reported under Agaricus in the Systema Mycologia. In certain genera only, where sufficient critical work has been done, e. g., Inocybe, has this procedure been varied. If inconsistencies occur it is because the methods of mycologists past and present have been inconsistent. Outside of possible errors each case has been treated with regard to the Brussels Rules on the one hand and the latest facts obtainable on the other. An attempt is made under many of the species to present as much material as possible for the further study of the species.

AN OUTLINE OF THE FUNGI

I. Mycelium lacking. *Bacteria.*
Mycetozoa.
Chytrids.

I. Mycelium forming the vegetative part of the plant. II.

II. Mycelium non-septate, (i. e., without cross-walls).
Phycomycetes.

II. Mycelium septate, (i. e., composed of many cells). III.

III. Spores not borne on a differentiated hymenium, not in asci nor on basidia. *Fungi Imperfecti.*

III. Spores usually borne on a differentiated hymenium. IV.

IV. Spores borne in asci, usually eight in an ascus.
Ascomycetes.

IV. Spores borne on basidia, usually four on a basidium.
Basidiomycetes.

The Basidiomycetes

(1) Basidia not forming a hymenium; spores borne on a four-celled basidium arising from resting-spores; parasites.
Smuts and Rusts.

(1) Basidia arranged so as to form a hymenium.....(2)

(2) Hymenium not in a special fruit-body but developed directly from the vegetative hyphae in the host. *Exobasidii.*

(2) Hymenium on or within a special fruit-body.....(3)

(3) Hymenium concealed within the fruit-body till spores are mature. (See 10th Rep. Mich. Acad. of Sci., p. 63.)
Gasteromycetes.

(3) Hymenium exposed .....*(Hymenomycetes.)* (4)

(4) Basidia forked or divided into four cells; plants usually gelatinous, horny when dry. *Tremellales.*

(4) Basidia clavate or subcylindrical. *Agaricales.*

Key to the Families of Agaricales

(1) Hymenophore* not differentiated; basidia scattered on a loose subiculum of hyphae. *Hypochnaceae.*

(1) Hymenophore even, not forming special branches, tubes, gills, etc. *Thelephoraceae.*

(1) Hymenophore in the form of wrinkles, warts, spines or tooth-like plates, usually on the under side of fruit-body.
Hydnaceae.

*The term "hymenophore" is here used to designate that part of the fruit-body which bears the hymenium, e. g., gills, tubes, spines, etc.

(1) Hymenophore in the form of erect branches or an erect, simple, club. *Clavariaceae.*

(1) Hymenophore in the form of tubes or reticulations, usually on the lower side of the fruit-body. *Polyporaceae.*

(1) Hymenophore in the form of knife-blades (gills); mostly fleshy plants. *Agaricaceae.*

KEY TO THE GENERA OF THE AGARICACEAE OF MICHIGAN

(a) Spores mostly white in mass (ochraceous-colored in some species of Russula and Lactarius) ..... (1)

(a) Spores ochraceous, cinnamon or rusty-yellow in mass.... (21)

(a) Spores flesh-color to roseate or salmon-color in mass.... (32)

(a) Spores purple-brown in mass ..... (39)

(a) Spores black in mass ..... (43)

White-Spored Agarics

1. Gills of waxy consistency: *Hygrophorus.*

1. Gills not truly waxy ..... (2)

2. Fruit-body, soft and fleshy, decaying..... (3)

2. Fruit-body toughish, corky or woody; thin plants shrivel on drying, revive when moistened ..... (15)

3. Gills thick on edge ..... (4)

3. Gills thin ..... (5)

4. Gills decurrent and forked dichotomously: *Cantherellus.*

4. Gills not decurrent; plants parasitic on other mushrooms: *Nyctalis.*

5. Trama of fruit-body of two kinds of tissue, i. e., of globular and filamentous cells; spores globose, echinulate..... (6)

5. Trama filamentous throughout ..... (7)

6. With milky juice: *Lactarius.*

6. Not with milky juice: *Russula.*

7. Stem eccentric, lateral or wanting: *Pleurotus.*

7. Stem central ..... (8)

8. Gills free ..... (9)

8. Gills adnexed ..... (10)

9. Volva and annulus present: *Amanita.*

9 Volva only present: *Amanitopsis.*

9. Annulus only present: *Lepiota.*

10. With annulus only: *Armillaria.*

10. Neither annulus nor volva present ..... (11)

11. Stem fleshy or fibrous, sometimes outer rind subcartilaginous ..... (12)
11. Stem cartilaginous, mostly throughout ..... (13)
12. Gills decurrent or broadly adnate, not sinuate at stem: *Clitocybe.*
12. Gills at length sinuate or emarginate on stem; mostly large plants on the ground: *Tricholoma.*
13. Gills decurrent, pileus umbilicate: *Omphalia.*
13. Gills not decurrent ..... (14)
14. Fruit-body small; pileus thin, tending to remain unexpanded and bell-shaped: *Mycena.*
14. Fruit-body small, medium or large; pileus usually expanded when mature, somewhat fleshy: *Collybia.*
15. Fruit-body usually small, toughish, thin, not woody..... (16)
15. Fruit-body larger; stem central, eccentric lateral or wanting ..... (17)
16. Trama of pileus gelatinous: *Heliomyces.*
16. Trama fleshy-membranous; pileus usually small, not woody: *Marasmius.*
17. Plant woody or corky: (*Lenzites*).
17. Plant fleshy-leathery ..... (18)
18. Gills of the usual kind ..... (19)
18. Gills longitudinally grooved or split on edge ..... (20)
19. Edge of gills serrate-torn: *Lentinus.*
19. Edge of gills entire: *Panus.*
20. Edge of gills split lengthwise: *Schizophyllum.*
20. Edge of gills obtuse, crisped: *Trogia.*

Ochre-Spored Agarics

21. Gills easily separable from the trama of the pileus; margin of pileus involute: *Paxillus.*
21. Gills not separating easily from the pileus..... (22)
22. Trama of pileus vesiculose; spores globose and echinulate. (See *Russula* and *Lactarius.*)
22. Trama more or less filamentous ..... (23)
23. Inner veil cobweb-like (cortinate): gills at length dusted dark cinnamon or rusty; terrestrial: *Cortinarius.*
23. Inner veil membranous, fibrous or floccose ..... (24)
24. Annulus present: *Pholiota.*
24. Annulus lacking ..... (25)
25. Stem lateral or wanting: *Crepidotus.*

25. Stem central ..... (26)
26. Stem fleshy or fleshy-fibrous ..... (27)
26. Stem cartilaginous or fragile ..... (29)
27. Gills at length yellow, yellow-rusty, etc.; lignicolous: *Flammula.*
27. Gills alutaceus to sordid brown; terrestrial..... (28)
28. Pileus fibrillose, silky or innately scaly; spores often angular; cystidia often present: *Inocybe.*
28. Pileus more or less viscid when moist, smooth: *Hebeloma.*
29. Gills decurrent: *Tubaria.*
29. Gills not decurrent ..... (30)
30. Pileus convex or plane, margin at first incurved; stem rather short: *Naucoria.*
30. Pileus bell-shaped or conical; stem slender..... (31)
31. Pileus subviscid or viscid; plant very fragile: *Bolbitius* and *Pluteolus.*
31. Pileus not viscid: *Galera.*

Pink-Spored Agarics

32. Stem lateral or lacking; on wood: *Claudopus.*
32. Stem central ..... (33)
33. Volva present only: *Volvaria.*
33. Annulus present only: *Chamaeota.*
33. Volva and annulus lacking ..... (34)
34. Gills free: *Pluteus.*
34. Gills adnexed, adnate or decurrent ..... (35)
35. Stem fleshy or fleshy-fibrous ..... (36)
35. Stem cartilaginous, slender ..... (37)
36. Gills at length sinuate: *Entoloma.*
36. Gills decurrent or broadly adnate: *Clitopilus.*
37. Gills decurrent; pileus umbilicate: *Eccilia.*
37. Gills not decurrent ..... (38)
38. Pileus convex, margin at first incurved: *Leptonia.*
38. Pileus bell-shaped to conical, margin at first straight: *Nolanea.*

Purple-Brown-Spored Agarics

39. Annulus present; veil distinct ..... (40)
39. Annulus and volva lacking ..... (41)
40. Gills free: *Psalliota.*
40. Gills attached to stem: *Stropharia.*

41. Veil present, remaining attached to margin of pileus, rarely forming an annulus: *Hypholoma.*
41. Veil, if at first present, quickly evanescent or none at all; slender-stemmed .....(42)
42. Margin of pileus at first straight; hygrophanous: *Psathyra.*
42. Margin of pileus at first incurved; gills adnexed to adnate-subdecurrent: *Psilocybe.*

Black-Spored Agarics

43. Gills delinquescing into a black mass when mature: *Coprinus.*
43. Gills not delinquescing .....(44)
44. Spores elongate-fusiform; gills decurrent; soft-waxy; pileus viscid: *Gomphidius.*
44. Spores globose to elliptical .....(45)
45. Pileus with striate or sulcate margin, fragile: *Psathyrella.*
45. Pileus not striate, rather fleshy, exceeding the gills; gills variegated-dotted by the spores: *Panoeolus.*

CANTHERELLEAE

Fruit-body fleshy or submembranous. Stem central or lateral. Gills thick, obtuse on edge, fold-like or ridge-form, usually forked, narrow. Veil none.

By the inclusion of Trogia and several tropical or subtropical genera, the group is extended by some authors to include sessile and reviving or arid plants. As limited above the group approaches the Thelepharaceae on the one side, the genera Clitocybe and Hygrophorus on the other. The genus Dictyolus Quel. belongs here, but no species have been found within the state. It is characterized by plants having a lateral stem arising from the larger mosses, and by vein-like, forked gills. *D. retirugus* is probably a native of the state. The group includes Cantherellus, Dictyolus and Nyctalis.

Nyctalis Fr.

(From the Greek, *nyx,* night, referring to the black color of the host-mushroom.)

White-spored; *chlamydo-spores abundant;* gills thick, distinct, obtuse on edge; stem central; *parasitic on other Agarics;* veil none.

Fleshy, putrescent, not large-sized mushrooms, developing on the pileus and stem of the fruit-bodies of Russula, Lactarius, Cantherellus, etc., after the latter have become well developed or are partially decayed. The gills and basidiospores in our species are often dwarfed or entirely undeveloped. The propagation of the plant is, instead, dependent on the presence of secondary spores which are formed in abundance over large parts of the surface of the plants. These spores are elliptical, brownish, long-spiny, 12-18 micr. in diameter. They are formed from the loosened hyphae of the surface of the pileus, etc., which break up into chains of spores, and because of this method of formation, are called *chlamydospores.*

1. Nyctalis asterophora Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1132, B.
Gillet, Champignons de France, No. 49.7.
Michael, Führer f. Pilzfreunde, Vol. II, No. 81 (as *N. lycoperdioides*).
Ricken, Blätterpilze, Pl. 2, Fig. 6.
Murrill, Mycologia, Vol. 6, Pl. 129.
Hard, Mushrooms, p. 204, Fig. 162.
Plate I of this Report.

PILEUS 1-2 cm. broad, at first subglobose then hemispherical, *whitish,* floccose, *at length dingy brownish and pulverulent.* FLESH pallid, moist, rather thick. GILLS adnate, distant, *rather narrow and thick,* obtuse, sometimes forked, whitish or dingy, *frequently not developed.* STEM 2-3 cm. long, 3-8 mm. thick, relatively stout, stuffed then hollow, pruinose or silky, whitish then brownish, often curved. SPORES often lacking by reason of the undeveloped hymenium, elliptical, smooth, 6 x 4 micr., white. CHLAMYDOSPORES on surface of pileus, etc., abundant, brownish, spiny, 12-18 micr., globose. ODOR and TASTE farinaceous.

Parasitic: on *Russula nigricans,* Bay View. August-September. Infrequent or local.

An interesting case of a parasitic mushroom; it has an entirely different structure from that of the host mushroom on which it grows. For other instances of parasitic mushrooms see *Stropharia epimyces, Volvaria Loveana, Boletus parasiticus,* etc.

Cantherellus Fr.

(From the Greek *kántharos,* a vase or cup, referring to the shape of the mature pileus.)

Spore-mass white or yellowish-tinged; Gills *forked, fold-like* or *almost ridge-form* (except *C. aurantiacus*), obtuse on edge; stem central, confluent with the pileus; veil none.

Fleshy, putrescent, terrestrial mushrooms, with a more or less turbinate, or vase-shaped pileus, in some species almost membranous, on whose outer side the reduced gills run down the stem in the form of fold-like, thick ridges or elevations, sometimes markedly dichotomously forked, sometimes almost entire. They approach

Craterellus, a genus of the Thelephoraceae, whose hymenial surface is merely wrinkled and not gill-like. The fleshy species are much sought after for the table, and all of them are *edible*. . Fries, in Epicrisis, included species whose stems are lateral or lacking; these have been segregated under other genera.

The PILEUS may be dull yellow, orange, red, cinereous or lilac-tinged. Sometimes it is deeply infundibuliform, as in the mature *C. floccosus,* or it may remain obtuse as in *C. cinnabarinus.* In the ashy or ashy-brown species the FLESH is thin and almost membranaceus and these approach species of Craterellus; in the others the flesh is thick. The GILLS afford the best means of recognizing the genus. In *C. aurantiacus,* however, the gills are thin, and, except for their marked dichotomous character, this species might be placed in the genus Clitocybe. The STEM is moderately stout in most species. In the fleshy forms it is solid, while in the cinereous-colored, thinner species it tends to become hollow, and in *C. infundibuliformis* the pileus is perforated so as to form an open tube down through the stem. The SPORES are usually elliptical or elongated, smooth, mostly white or whitish, but in some species tinged with yellow or ochraceous in mass. The BASIDIA are unusually elongated and approach those of Hygrophorus in this respect; they are said to be sometimes six or eight-spored. The ODOR and TASTE of our species is mild and agreeable.

Key to the Species

(a) Plant cinnamon-red, fading, medium size. 5. *C. cinnabarinus* Schw.
(aa) Plant not red.
  (b) Pileus and gills some shade of yellow or orange.
    (c) Gills orange, thin, crowded. 9. *C. aurantiacus* Fr.
    (cc) Gills not crowded, ridge-form.
      (d) Stem solid, firm.
        (e) Plant markedly vase-shaped; pileus deeply funnel-form, firm, rufous-orange. 3. *floccosus* Schw.
        (ee) Plant somewhat top-shaped, entirely chrome-yellow or flavus. 4. *C. cibarius* Fr.
        (dd) Stem hollow, pileus thin, funnel-form. 6. *C. infundibuliformis* Fr. 7. *C. tubaeformis* Fr.
  (bb) Pileus and gills not both yellow.
    (c) Gills flesh-color to purplish-lilaceus, ridge-form; stem solid. 2. *C. clavatus* Fr.
    (cc) Gills not flesh-color.
      (d) Pileus infundibuliform, cinereous or brownish cinereous.
        (e) Pileus perforated in center, stem hollow. 6. *C. infundibuliformis* Fr.
        (ee) Pileus not perforated; stem stuffed or solid. 7. *C. tubaeformis* Fr.
      (dd) Pileus obtuse, or depressed; subumbonate, brownish-gray. 8. *C. umbonatus* Fr.

**Gills in form of thick ridges, rather distant.*

2. Cantherellus clavatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Atl. Svamp, Pl. 91.
Michael, Führer f. Pilzfreunde, Vol. II, No. 19 (as Craterellus).
Bresadola, I, Fungh. Mang. e. vel., Pl. 82.
Ricken, Blätterpilze, Pl. 1, Fig. 1.
Patouillard, Tab. Analyt., No. 434 (as *C. neurophyllus*).
Plate II of this Report.

PILEUS 3-5 cm. broad, turbinate to truncate-obclavate, depressed to *concave-cyathiform,* often irregular and lobed, narrowed into the stem, at first purplish-flesh color, *soon* greenish-yellow, surface floccose or slightly scaly. FLESH *thick behind,* white, *compact at first,* at length toughish. GILLS in form of *thick, dichotomous, narrow but distinct ridges, connected by cross-ridges,* anastomosing below, long decurrent from the elevated margin of the pileus, rather distant, *flesh-color to pale purplish umber.* STEM expanding into the pileus, *solid, short,* rather firm, *fleshy,* at first incarnate-purplish, then pallid, below densely white-floccose, 4-8 mm. thick, usually tapering downward. Whole plant 4-9 cm. tall. SPORES subcylindrical or narrow elliptcal, 10-12 x 4-5 micr., smooth, pale ochraceus in mass. ODOR and TASTE mild.

Gregarious, on the ground in hemlock forests of northern Michigan. Bay View, Marquette. July-August. Infrequent.

Well marked by its color and shape. In his later works Fries referred it to the Thelophoroceae under Craterellus. Its thick flesh and the well-marked ridges of the Cantherellus-type, seem to be sufficient reason to refer it back to Cantherellus.

3. Cantherellus floccosus Schw. (Edible)

Trans. Amer. Phil. Soc. II, 4, 1832.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 55, Fig. 9-13.
Peck, N. Y. State Mus. Rep. 33, Pl. 1, Fig. 18-20.
Hard, Mushrooms, Pl. 23, Fig. 160, p. 201, 1908.
White, Conn. State Geol. & Nat. Hist. Surv. Bull., No. 15, Pl. 19.

PILEUS 5-10 cm. broad (rarely broader), vase-shaped or trumpet-shaped, truncate when young, at length *deeply excavate-funnel-form,* firm, superficially floccose or subscaly, yellow at first, *at length rufescent to orange,* margin becoming undulate at times. FLESH rather thick, confluent with the stem, white. GILLS deeply decurrent, *ridge-form,* close to subdistant, *dichotomously forked, anastomosing throughout,* ochraceus to rufous-yellowish, sometimes darker. STEM short, whole plant 6-15 cm. high (rarely 20 cm.), 1-2.5 cm. thick, *solid,* glabrous, pallid-ochraceus, whitish at base, firm, sometimes abruptly short-attenuate at base, often deep in the ground. SPORES elliptical, "12-15 x 7-7.2 micr.", smooth, ochraceous in mass. ODOR and TASTE mild and pleasant.

On the ground in hemlock forests of northern Michigan, Marquette, Huron Mountains. July-August. Infrequent.

A most striking plant when in full luxuriance, forming a large vase with considerable capacity to its deep interior. It occurs gregariously but sometimes several arise at one place or apparently from the same stem. I have not seen it in the portion of the state where hemlock and pine are unknown. Like the preceding, it is scarcely possible to confuse it with any other species.

4. Cantherellus cibarius Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. ätl. Svamp., Pl. 7.
Cooke, Ill., Pl. 1103.
Gillet, Champignons de France, No. 88.
Ricken, Blätterpilze, Pl. 1, Fig. 2.
Michael, Führer f. Pilzfreunde, Vol. 1, No. 26.
Swanton, Fungi, Pl. 15, Fig. 3-5.
Atkinson, Mushrooms, Fig. 123, p. 128, 1900.
Hard, Mushrooms, Pl. 22, Fig. 128, p. 199.
Gibson, Edible Toadstools & Mushrooms, Pl. 19, p. 175, 1903.
Peck, N. Y. State Mus. Rep. 48, Pl. 32.
Plate III of this Report.

PILEUS 3-8 cm. broad, firm convex then expanded, soon depressed in center or margin elevated, often irregular, sometimes top-shaped, infundibuliform or one-sided, margin thick and at first involute, *chrome-yellow or pale egg yellow,* glabrous, not striate. FLESH compact, thick, white or yellowish toward surface. GILLS long, decurrent, thick, dichotomously forked or anastomosing, nar-

row, *rather distant, chrome-yellow,* edge blunt. STEM 3-6 cm. long, stout, 6-12 mm. thick, narrower downwards, solid, fleshy, glabrous, *chrome-yellow to pale yellow,* often tunneled by larvae. SPORES elliptical, 7-9 x 4-5 micr., smooth, faintly ochraceous-tinged. "BASIDIA 50-75x7-8 micr., 4-spored, sometimes 5-6 spored." ODOR and TASTE mild and pleasant.

Gregarious or subcaespitose, often scattered. On the ground in frondose or conifer forests . Throughout the state, from the southern border to Isle Royale. July-September (rarely earlier or later). Frequent only in certain seasons.

This is the famous "*Chantarelle*" of Europe, where it is highly prized, both on account of its flavor and from the fact that its flesh is free from larvae. In Michigan, and probably elsewhere in the eastern part of the United States, the fastidious lovers of mushroom meat are, alas, not so fortunate as their European brethren. During many years of collecting, I have rarely found this mushroom free from larvae and I have a large number of records.. Occasionally, immediately after its rapid development due to favorable weather, I have found unattacked specimens. The color is often much paler yellow than that mentioned above and a white form is sometimes found. It is not easily confused with *C. aurantiacus,* which has thin and crowded gills and different shades of yellow.

5. Cantherellus cinnabarinus Schw. (Edible)

Trans. Amer. Phil. Soc. II, 4, 1832.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 55, Fig. 1-8.
Murrill, Mycologia, Vol. 5, Pl. 92, Fig. 3.
Hard, Mushrooms, Fig. 161, p. 202, 1908.
Plate II of this Report.

PILEUS 1.5-3 cm. broad (rarely up to 7 cm.), firm, *convex and obtuse or expanded-depressed,* often *irregular, glabrous, cinnabar-red,* often faded, entirely faded in dried specimens. FLESH rather thin, whitish or tinged reddish toward surface. GILLS long-decurrent, dichotomously forked, *rather distant*, narrow and ridge-form, intervenose, *cinnabar-red,* yellowish or pinkish. STEM 2-4 cm. long, 4-6 mm. thick, *solid* or subcavernous, terete or compressed at apex, equal or tapering downward, tough-fleshy, glabrous, even, cinnabar-red or paler. SPORES oblong-elliptical, 8-10 x 4-5.5 micr., smooth, white or faintly pink in mass. BASIDIA long and narrow, 4-spored. ODOR and TASTE mild.

Gregarious, on the ground in open frondose woods or on bare soil along woodroads. Ann Arbor, Detroit, New Richmond, at least throughout the Southern Peninsula. July-October. Frequent.

Easily known by its color and size. When fresh the color is cinnabar-red but after exposure to wind and sun the color may be lost. Often the stem is diluted and compressed toward the apex, in which case it is found to be somewhat hollow. Typically the stem is solid. Some think *C. friesii* Quel. is the same, but that species is said to have a velvety-flocculose cap, different colors and probably smaller spores. Both fade, and the dried specimens probably look much alike. Our plant seems to be a distinct American form.

6. Cantherellus infundibuliformis Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1109.
Ricken, Blätterpilze, Pl. 1, Fig. 4.
Michael, Führer f. Pilzfreunde, Vol. II, No. 41.
White, Conn. State Geol. & Nat. Hist. Surv. Bull. No. 3, Pl. 15, op. p. 35.
Peck, N. Y. State Mus. Mem. 4, Pl. 56, Fig. 9-16.

PILEUS 2-5 cm. broad, umbilicate to infundibuliform, *margin undulate or lobed,* pruinose-flocculose, glabrescent, cinereus-yellowish to watery-brown, paler when dry. FLESH *thin,* concolor. GILLS decurrent, narrow, ridge-form, dichotomously or irregularly forked, *pruinose, distant,* cinereous. STEM 3-9 cm. long, 3-7 mm. thick, *slender,* equal or subequal, glabrous, *hollow, terete or compressed, yellow.* SPORES globose- elliptical. 9-11x7-9 micr., smooth pale yellowish in mass. ODOR and TASTE none.

Gregarious on the ground in wet swampy places, especially in conifer woods. Marquette, Houghton, New Richmond. August-October.

Distinguished from all the preceding by its thinner somewhat pliant pileus and darker colors; it often has a sooty or ashy shade. The center of the cap is usually perforated so as to expose the hollow cavity of the stem from above. Its spores are quite characteristic and set it off from its near relatives, which Murrill (N. A. Flora, Vol. 9, p. 168) has seen fit to include in this single species.

7. Cantherellus tubæformis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde, Vol. II, No. 41.
(?) Cooke, Ill., Pl. 1108.

PILEUS 2-5 cm. broad, convex and obtuse, at length depressed and margin irregular and recurved, sometimes subinfundibuliform, *not perforated in center,* brownish-yellow to yellowish ochraceus, *silky-tomentulose,* even, scarcely fading. FLESH *thin* at least toward margin, whitish-ochraceus. GILLS arcuate-decurrent, moderately thick, narrow and ridge-form, dichotomously forked, intervenose, *rather distant, not pruinose,* flesh-gray to yellowish-ochraceus, often slightly deeper in color than pileus and stem. STEM 3-6 cm. long, 3-6 mm. thick (sometimes thicker), fulvous-yellow to ochraceous, concolor within, *terete or canaliculate,* sometimes compressed, subequal, *solid or stuffed at first,* sometimes at length hollow, glabrous, often curved, white at the very base. SPORES broadly elliptical, 7-9.5x5-6 micr. punctate-granular, pale creamy-white in mass. BASIDIA 60-65x6-8 micr. long, slender, attenuate downward. ODOR and TASTE none.

On the ground or debris of frondose woods of southern Michigan. Ann Arbor and surrounding region. July-August. Infrequent.

Characterized primarily by its spores and its stuffed stem. It differs from the preceding also in its rather constant colors. Most of our plants were entirely yellowish-ochraceous when fresh and the stem was not hollow. The thin structure of the cap separates it from other yellowish species. Its name is misleading, since in its near relative, *C. infundibuliformis,* the tube is continuous from the stem to the surface of the pileus, while here the cap is not perforated, and the stem usually not hollow except in age. My observations agree with those of Ricken in these respects. *Cantherellus lutescens* is a related species, with an orange-yellow stem, blackish-brown, floccose-scaly cap and orange gills. Its spores are said to measure 10-12x7-8 micr.

***Gills approaching the form of those of true Agarics, close or crowded.*

8. Cantherellus umbonatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1106.
Gillet, Champignons de France, No. 94.
Ricken, Blätterpilze, Pl. 2, Fig. 1.
Michael, Führer f. Pilzfreunde, Vol. III, No. 51.
Peck, N. Y. State Mus. Bull. 67, Pl. 84, Fig. 8-21 (as *C. dichotomous* Pk.).

PILEUS 2-4 cm. broad, top-shaped, convex to plane and depressed, *brownish-gray to blackish or smoky-gray, with or without a slight umbo,* pruinose or flocculose, dry, pliant, margin regular or wavy. FLESH *thin,* white, becoming reddish with age or some time after picking. GILLS decurrent, rather narrow, thick, dichotomously branched, *not ridge-form,* close, white, then *stained yellowish or reddish,* even on edge. STEM 3-8 cm. long, 4-7 mm. thick, equal or attenuated up or down, elastic, pallid or pale gray, sometimes smoky above, appressed-silky, stuffed, soft fleshy-fibrous within. SPORES narrow, subfusiform-elliptical, 9-11x3-4.5 micr., smooth, white in mass.

Gregarious, attached to moss, especially Polytrichum, around peat-bogs or in swampy woods.

Houghton, Ann Arbor, probably in lake districts throughout the state. July-October. Frequent in fall till frosts or later.

Distinguished from the preceding two by the more highly developed gills, the slight umbo and the tendency for the flesh and gills to assume reddish stains after being collected. In many cases it is attached directly by its mycelium to the stems and leaves of living mosses. There is no doubt that *C. dichotomous* Pk. is the same species, since the descriptions of *C. umbonatus* with which Peck compared his plant were incomplete, as Saccardo omitted the fact that the gills are dichotomously forked.

9. Cantherellus aurantiacus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. ätl. Svamp, Pl. 79.
Cooke, Ill., Pl. 1104.
Gillet, Champignons de France, No. 86.
Michael, Führer f. Pilzfreunde, Vol. 1, No. 27.
Ricken, Blätterpilze, Pl. 2, Fig. 2.
Atkinson, Mushrooms, Pl. 37, Fig. 124-125, p. 129, 1900.
Hard, Mushrooms, Fig. 159, p. 200, 1908.

PILEUS 2-6 cm. broad (rarely 7) pliant, convex-plane, depressed, at length often concave-subinfundibuliform with elevated margin, margin at first involute at length undulate, *orange-ochraceus to brownish-orange,* sometimes pale, *subtomentose* or subsquamulose on disk, even. FLESH *soft,* somewhat thick, thin on margin, pallid or tinged ochraceous. GILLS arcuate-decurrent, *thin,* edge blunt, dichotomously forked, *crowded,* rather narrow, *not ridge-form, bright orange* or tinged with salmon-color. STEM 3-5 cm. long, 4-10 mm. (or more) thick, *spongy,* thickened downwards, or subequal, *stuffed* sometimes hollow, minutely tomentose, *pale orange* varying brownish or pallid-yellowish. SPORES elliptical, 5-7 x 3-4 micr., smooth, whitish in mass. ODOR and TASTE mild.

Gregarious, on the ground, much decayed logs or wood, among debris, in conifer and frondose woods, more abundant northward. Throughout the state. July-October. Frequent.

Distinguished from *C. cibarius* by its thin, crowded gills and orange colors. A form occurs with pale yellowish-white cap and stem; this I have seen in Sweden where it is more common than with us. Fries says a white form also appears. It is marked poisonous or suspected by many European authors, although Peck, McIlvaine and others have eaten it without bad results, but the flavor is said to be poor. It occurs mainly in conifer woods but also in low frondose woods, perhaps where tamarack once grew.

MARASMIEAE

Fruit-body reviving in moist weather, becoming shriveled when dry; fleshy-leathery, tough or toughish, persistent, normally not putrescent. Stem when present, confluent with the pileus. Partial veil or universal veil lacking.

The species of this subfamily are well-marked by their ability to cease growing and to shrivel up in dry weather, and by their rejuvenescence and further development when they become wet again. The gills are never corky or woody and only slightly fleshy, usually arid and toughish. It is possible, however, to find forms which approach Collybia, Mycena and Pleurotus and which represent connecting links between those genera and Marasmius. The following genera are included: Trogia, Schizophyllum, Panus, Lentinus, Marasmius, and Heliomyces.

Trogia Fr.

(After *Trog,* a Swiss botanist.)

White-spored. Flesh toughish, arid, reviving in wet weather. Gills arid, fold-like, obtuse. Pileus sessile, or resupinate-reflexed.

Small, lignicolous, reviving plants, usually attached to dead branches of frondose trees. Related to Cantherellus by the plicate, i. e., fold-like gills, but tougher and reviving, as in Schizophyllum. The genus is placed under the Cantharelleae by some authors but the persistent, reviving and arid characters ally it equally close to the Marasmieae. The pileus is either attached at a more or less eccentric point or resupinate for some distance and the gills are exposed in moist weather, but the dried pileus usually infolds on the margin so as to hide the gills which are mostly irregular or crisped.

10. Trogia crispa Fr.

Monographia, 1833.

Illustrations: Cooke, Ill., Pl. 1114.
Gillet, Champignons de France, No. 708.
Patouillard, Tab. Analyt., No. 14.
Ricken, Blätterpilze, Pl. 2, Fig. 5.
Atkinson, Mushrooms, Pl. 39, Fig. 131, op. p. 137, 1900.

PILEUS 1-2 cm. broad, tough, *sessile,* sometimes couchate or shelving, often resupinate when moist, sometimes subimbricate, persistent, *reviving* when moist, irregularly incurved when dry, surface tinged reddish-yellow with whitish hairs, *becoming tan or buff-brownish when dry, margin lobed.* FLESH thin, fleshy-membranaceous. GILLS very narrow, irregularly vein-like, interrupted or entire, often forked, crisped, white or bluish-grey. SPORES cylindrical, smooth, 3-4 x 1-1.5 micr., white.

Scattered, gregarious, often closely crowded on limbs or bark of frondose trees, especially beech, birch and cherry. Throughout the state. Frequent.

When dry the plants roll up irregularly and almost hide the gills, the white color of which when fresh is rather sharply contrasted in most cases with the color of the pileus. It has been placed in the genus Plicatura by some authors.

11. Trogia alni Pk.

N. Y. State Mus. Rep. 24, 1872 (as *Plicatura alni*).

"PILEUS 1.5-2.5 cm. broad, coriaceous, *resupinate-reflexed,* generally imbricated, silky-tomentulose, *brownish-tawny,* the margin sterile. GILLS narrow, irregular, interrupted wavy or crisped, angular, white, becoming inconspicuous on drying."

"On alder, etc."

This species has not been reported in the state, but is included for the sake of comparison. Some consider it identical with *Merulius niveus* Fr., but that species is said to be pure white.

Schizophyllum Fr.

(From the Greek, *schizo,* to split and *phyllon,* a leaf, referring to the split edge of the gills.)

White-spored. Leathery-tough, arid, reviving in wet weather. Gills split halfway from the edge inwards. Trama of pileus thin. Veil none.

Only one species is known in our region, but this is very common. It grows on wood, on dead branches and trunks of standing trees or more rarely on fallen limbs. The gills are very characteristic, differing markedly from those of other genera by being split and the halves recurved, and the structure of the two layers is continued upwards almost through the pileus so that a thin pellicle covers the surface.

12. Schizophyllum commune Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1114 B.
Gillet, Champignons de France, No. 641.
Atkinson, Mushrooms, Fig. 130, p. 136, 1900.
Hard, Mushrooms, Fig. 187, p. 233, 1908.

PILEUS 1-3 cm. broad, thin, tough, pliant, *sessile* by the narrowed base, from which it extends in a fan-shaped manner, often suborbicular and lobed on the incurved margin, tinged with brownish-gray when moist, *whitish when dry,* very hairy or tomentose, reviving. GILLS radiating from the point of attachment of the pileus, leathery-tough, split on edge, white or gray, sometimes with other tints, tomentose, on the inner side of the split. SPORES minute, cylindrical, 3-4 x 1-1.5 micr.

Scattered or gregarious on dead branches or trunks of frondose trees, especially of hickory; also on carpinus, walnut, elm, maple, sycamore, locust, apple and probably others. Throughout the state. Very common.

This is a pretty fungus when growing in luxuriance and can not be easily mistaken for anything else. Some species of Pleurotus have a similar habit, but are different in texture and especially in the structure of the gills.

Panus Fr.

(From the Latin, *panus,* a tumor. Fries says the name was used by Pliny for a tree-inhabiting fungus.)

White-spored. *Fleshy leathery, reviving,* tough, persistent; the texture fibrous, radiating into the hymenium. Stem eccentric, lateral or lacking, confluent with the pileus. Gills at length coriaceous, *edge entire.*

Not putrescent, but arid and tough as in the genera Lentinus, Marasmius, etc. They approach Pleurotus and some species have been described under that genus. They are wood-inhabiting. *P. stipticus* has *poisonous* properties, the others are harmless.

The PILEUS is eccentric, lateral or at first resupinate; none of the last section has been distinguished in the state. The erect forms often have very irregular and crowded and depressed pilei which are somewhat thick. Their surface is usually strigose, villose

or slightly scaly. The color is various. The FLESH varies from quite tough in some species to somewhat fleshy in others; the latter may become more tough with age so that several species are easily confused with Pleurotus in the young stage. It is advisable to compare specimens with both genera where the texture is in doubt. The GILLS have an entire edge which distinguishes them from those of the genus Lentinus which have lacerate, serrate, thin edges. They become tough with age and are thickish. Intermediate forms occur, especially among typical species, so that some authors combine Panus with Lentinus. In our plants, however, the character of the edge of the gills is the best means of separation. The STEM is short, as a rule, sometimes continuous with the pileus, so that the pileus is not marginate behind. It is usually hairy or scaly. The SPORES vary in shape and size; they are smooth and white. CYSTIDIA are present in *P. rudis* and *P. angustatus.*

Several of the species are very common, growing on stumps, decayed branches, etc., in the cities, or on any sort of dead timber in the woods and fields. The harmless species are rather tough for the table, but can be used, according to McIlvaine, to flavor soups and gravies.

The genus is divided into three sections, of which the following include the species described below:

I. Conchati.
II. Stiptici.

Key to the Species

(A) Pileus sessile or prolonged laterally into a stem-like base.
  (a) Pileus with a gelatinous layer, whitish or yellowish, spathulate to fan-shaped. 16. *P. angustatus* Berk. (Syn. *Pleurotus stratosus* Atk.)
  (aa) Pileus without a gelatinous layer.
    (b) Gills when young covered by a fugaceous veil; pileus about 1 cm., cupulate, rufous. On alder bushes. *P. operculatus* B. & C.
  (bb) Without a cortina.
    (c) Pileus hygrophanous, small, pinkish-gray; gills dark ferruginous; on willows. 17. *P. salicinus* Pk.
    (cc) Pileus not hygrophanous, small, heaped in clusters, pale brownish; taste very disagreeable, astringent. 15. *P. stipticus* Fr.

(AA) Pileus with an eccentric stem; i. e. pileus marginate behind.
  (a) Pileus white or creamy-white when fresh, becoming yellowish when drying.
    (b) Pileus often very large, densely strigose-hairy; whole plant becomes dull yellow when dried. 12a. *P. strigosus* B. & C.
    (bb) Pileus up to 6 cm. broad, surface with long, delicate hairs, margin reticulated. *P. laevis* B. & C.
  (aa) Pileus reddish-brown to alutaceous-tan, medium size, margin at first inrolled.
    (b) Pileus rough with tufted hairs, tawny-alutaceous, etc., gills

crowded and narrow. 13. *P. rudis* Fr. (Syn. *P. strigosus* Schw.)
(bb) Pileus glabrous or obscurely fibrillose-scaly.
(c) Gills crowded and narrow. 14. *P. torulosus* var. *conchatus* Fr.
(cc) Gills close to subdistant. 14. *P. torulosus* Fr.

(Other species have been described by Peck, *P. betulinus* on birch, from Newfoundland, with a dimidiate, grayish-brown pileus; *P. nigrifolius* from Alabama, with distant, dark-brown gills. *P. dealbatus* Berk. was described from Ohio; it has an umber color throughout, with the shape of *P. angustatus*. *P. albotomentosus* Cke. & Massee, reported by McIlvaine, is probably the same as *Pleurotus albolanatus* Pk. of this report. *P. dorsalis* Bosc. is the same as *Claudopus nidulans*.)

Section I. Conchati. Stem eccentric; pileus irregular or conchate.

12a. Panus strigosus B. & C. (Edible)

North American Fungi, No. 99.

Illustration: Plate IV of this Report.

PILEUS *large,* varying from 10 to 40 cm. broad, *subcentral, strongly eccentric or lateral,* marginate behind, fleshy-fibrous to subcoriaceous, convex, subexpanded, *reniform, covered with a dense, thick, strigose-villose nap* composed of hairs up to 2 mm. long in large specimens, *creamy-white* when fresh, *becoming yellow on drying.* FLESH firm, somewhat tough, up to 2 cm. thick, tapering to the very thin margin, yellowish when fresh, white when dry. GILLS subdecurrent, *broad,* close to subdistant, heterophyllous, thick, white, changing to yellow on drying, *edge entire.* STEM short or long, *stout,* 2-15 cm. long, 2-4 cm. thick, *strigose-villose,* eccentric or almost lateral, whitish to yellowish, sometimes tinged cinereous. SPORES elongated-oblong, 11-13 x 3½-4½ micr., smooth white in mass. CYSTIDIA none. ODOR stronger in age, rather agreeable.

(Dried: Strigosity and cuticle are dull golden-yellow, flesh whitish, gills ferruginous.)

Solitary or caespitose, subimbricate, growing from the wounds of maple and yellow birch; also on apple trees and other deciduous trees. Probably throughout the state; Houghton, New Richmond. August-September. Infrequent or rare. Edible when young.

This is the largest Panus we have; the pileus is often a foot and

more in diameter and the stem very stout. The descriptions in the books are very meagre, and no mention is made of the change of color on drying. The dried specimens are elegant. Its flesh is not very tough and it is easily mistaken for a Pleurotus. The gills are very broad in large specimens, not truly distant, and are usually distinct on the stem or anastomose only in an obscure manner if at all. Some specimens are almost lateral, growing in a somewhat ascending-subhorizontal position, but with a marginate pileus; others have a subcentral stem. This is not *Lentinus strigosus* Schw., a species which seems to be synonymous with *Panus rudis*. Some consider *P. laevis* B. & C. to be the same as *P. strigosus*.

13. Panus rudis Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Hard, Mushrooms, Fig. 179, p. 224, 1908.
Ricken, Blätterpilze, Pl. 26, Fig. 4.
Patouillard, Tab. Analyt., No. 637.
Plate V of this Report.

PILEUS 2-7 cm. broad, irregular, eccentric or sublateral, ascending, depressed or vase shaped, sometimes infundibuliform, cuneate-rounded when young, *tough, villose-velvety or strigose,* alutaceous to reddish brown, *margin often lobed,* incurved. GILLS *narrow,* crowded, decurrent, pallid or tinged with the color of pileus, pubescent, *edge entire.* STEM *short,* eccentric, sometimes almost lacking, *villose, concolor.* SPORES elliptical-oval, 5-6 x 2-3 micr., smooth, white. TASTE slightly bitter at times. ODOR none.

Caespitose-crowded. Everywhere in town and country, on stumps, logs, dead branches, trunks, etc., of frondose trees. Throughout the state. May to November. *Very common.*

This is *Lentinus lecomtei* of many American notices, not the true *L. lecomtei* Schw. which has serrate gills. Our plant has entire gills. Schweinitz described the true *L. lecomtei* from a specimen sent from Georgia by Lecomte. (See Lloyd, Myc. Notes, Vol. I, p. 60.) It is also *Lentinus strigosus* Schw. to which Peck refers his specimens. Peck says it was found in one case on a balsam fir trunk, while ordinarily it is limited to deciduous trees. Patouillard says the gills of *P. rudis* are serrate, which is a rather remarkable statement. It can be used for flavoring gravies and dries well for winter use, but is readily attacked by beetles.

14. Panus torulosus Fr. (Edible)

Syst. Myc., 1821. (As *Pleurotus torulosus.*) Epicrisis, 1836-38.

Illustrations: Hard, Mushrooms, Fig. 180, p. 225, 1908.
Gillet, Champignons de France, No. 511.
Cooke, Ill., Plate 1149.

PILEUS 5-10 cm. broad, or broader, fleshy-pliant at first then tough, from plane to infundibuliform, eccentric or almost lateral, marginate behind, *livid flesh color or tinged violet or reddish,* surface when young and fresh with a delicate, detersile tomentum, soon *glabrous,* sometimes slightly scaly in the center of the cup, even on the margin, sometimes wavy. FLESH pallid, thickish, becoming thinner when full-grown. GILLS decurrent, *close to subdistant,* narrow, simple, occasionally forked, sometimes anastomosing on the stem, pallid to violet rufescent then alutaceous, *edge even.* STEM short, 2-3 cm. long, 1-3 cm. thick, stout, solid, tough, eccentric or lateral, *covered with a violaceous or gray tomentum.* SPORES elliptical, 6 x 3 micr., smooth, white.

Caespitose, on decaying stumps, logs, trunks, etc., of frondose trees. Ann Arbor. September. Infrequent.

Var. *conchatus* Fr. Pileus thinner, alutaceous and not with violet tints; gills closer. On beech log, Bay View. Infrequent. Becoming quite large, up to 15 cm. broad.

The species of Fries, *Panus conchatus,* does not seem to me specifically distinct, as the characters which he emphasizes occur also in *P. torulosus.* Specimens of the latter can be found whose pileus becomes minutely scaly at length, and whose gills vary forked and anastomosing, although never markedly so. The closeness of the gills depends somewhat on the expansion of the pileus and this varies not a little. Under certain weather conditions, the violet and reddish tints of *P. torulosus* are lacking, and then the plant could be referred to the other species. The spores of the two species, if I have interpreted correctly, are exactly alike, and unless structural differences can be shown it were better to make *P. conchatus* a synonym of *P. torulosus* as was done by Quelet. (Euchiridion Fungorum.) If collected in dry weather, they may be confused with infundibuliform species of Clitocybe.

Section II. Stiptici. Pileus sessile or prolonged behind into a stem-like base.

15. Panus stipticus Fr. (Poisonous)

Syst. Mycol., 1821. (As *Pleurotus stipticus.*) Epicrisis, 1836-38.

Illustrations: Hard, Mushrooms, Fig. 178, p. 222.
Ricken, Blätterpilze, Pl. 26, Fig. 3.
Michael, Führer f. Pilzfreunde, Vol. 3, No. 66.
Gillet, Champignons de France, No. 510.

PILEUS 1-3 cm. broad, *very tough,* pale cinnamon, fading to whitish, convex, subreniform, depressed and abruptly narrowed behind, surface breaking up into minute, furfuraceous scales, even. GILLS thin, *determinate,* i. e., abrupt behind, venose-connected, crowded, *cinnamon.* STEM lateral, short, distinct below, solid often compressed, pruinose, paler than gills. SPORES minute, narrowly oblong, 4-5 x 2 micr., smooth, white. TASTE *very astringent.* CYSTIDIA none on sides of gills.

Caespitose. On wood; stumps, logs, trunks, etc. Throughout the state. May to October. Common.

This little Panus is not edible, because of its toughness and its very disagreeable taste. It is said to be a violent purgative. When fresh it is slightly phosphorescent in a dark room. On the under side it appears to have a very definite stem, ending abruptly at the gills; above, the stem is not distinguishable. It revives when moistened, so that a cluster may be seen in place during the whole season.

16. Panus angustatus Berk.

Lea's Catalogue of Plants, 1849.
See also *Pleurotus stratosus* Atk.=syn, Jour. of Mycol., Vol. 8, 1902.

PILEUS 2-5 cm. broad, *obovate to broadly cuneate,* sessile or prolonged into a stem-like base, convex or depressed, sordid white to pale tawny, *trama composed, under the microscope, of four layers* (a) the surface layer of erect hyphae which form a minute tomentum; beneath this (b) a thin, compact layer; (c) a gelatinous layer of open, slender, distant, palisade threads; (d) a compact, floccose-interwoven layer, about half the thickness of the pileus; margin crenate-wavy. FLESH thin, tough, soft. GILLS converging, very narrow, crowded, white or yellowish. SPORES minute, spheroid-oval, 3 micr. diam., smooth, white in mass. CYSTIDIA numerous, fusoid or lanceolate, 45-60 x 10-14 micr. BASIDIA 4-spored.

Caespitose, often imbricate, sometimes solitary, on very rotten wood of birch, hemlock, etc., of northern Michigan. Bay View, Houghton, Negaunee. July-August. Infrequent. Probably edible.

This species has much the appearance of *Pleurotus petaloides* and *Pleurotus albolanatus*. When fresh it is hard to tell whether it ought to be referred to Panus or Pleurotus. I have found it only in the region of conifer or mixed woods.

17. Panus salicinus Pk.

N. Y. State Mus. Rep. 24, 1872.

"PILEUS 8-12 mm. broad, firm, thin, convex, deflexed or subpendant, *hygrophanous*, minutely farinaceus-tomentose, pinkish-gray. GILLS moderately broad and close, converging to an eccentric point, *dark ferruginous*. STEM very short below or obsolete, obliquely attached to the vertex of the pileus."

"Gregarious. Trunks of dead willows."

This was reported by Longyear in 4th Report Michigan Academy of Science. I have given Peck's description.

Lentinus Fr.

(From the Latin, *lentus*, tough.)

White-spored. *Fleshy-leathery, tough,* reviving, persistent, *often becoming hard when old.* Stem eccentric, lateral or none, confluent with pileus. Gills concrete with pileus, *thin,* membranous, *edge becoming serrate or lacerate.*

Tough, even somewhat woody in age, lignicolous and polymorphous. They approach the fleshy Pleuroti on one side, and the woody Lenzites on the other. From Panus the thin, lacerate edge of the gills alone distinguishes them. They are very abundant in the tropics but there are relatively few species with us.

The PILEUS varies in size, being quite large in *L. lepideus* and *L. vulpinus,* or only about a centimeter broad in our small forms. It is often scaly spotted, by the breaking up of the cuticle. The GILLS are thin as compared with our species of Panus, and become lacerated-serrate on the edge. Their texture is homogeneous with the trama of the pileus and not at all separable from it, as is the case with the section Paxilloideae of the genus Clitocybe. They are white but often become dingy and arid with age, and are usually decurrent or become so at maturity. The STEM is tough, often

hard and woody at the base where it is inserted, i. e., instititious, on the ligneous substratum. Although normally eccentric or lateral in our species, it may become central, especially when growing on top of the substratum. Some species have adapted themselves to the debris or humus on the ground, so as to appear terrestrial. In one section there is often a definite *veil,* as in *L. lepideus* and *L. tigrinus* but it soon disappears or only rarely remains on the stem or on the margin of the young pileus as shreds or fibrils. The SPORES vary in shape, in our species mostly elongated-oblong or elliptical. Fries in characterizing the genus (Hymen. Europ.), as well as Quelet (Enchiridion) and Patouillard (Les Hymen. d'Europe), say the spores are subglobose. This is not at all the case with all of our species, although it may apply to the majority of tropical ones. Massee (Agaricaceae, Eur. Fung. Flora) records comparatively few spore-measurements, so that the statement of the above authors seems remarkable. The spores are white, smooth and often no longer present in old specimens. CYSTIDIA are lacking.

This is a troublesome genus because of the fact that the nature of the context, determines largely its place in the classification. Hence various species have been referred here by mycologists only to be later removed to genera with fleshy or fibrous context. Originally the genus Panus was included and some authors still include it. *Panus rudis* is commonly called *Lentinus Lecomtei,* the latter being a species we do not have with us. *Lentinus strigosus* Schw. is also *Panus rudis. Collybia lacunosa* Pk. is often mistaken for a Lentinus, and was erroneously referred to *L. chrysopeplos* B. & C. in the 8th Rep. Mich. Acad. Sci., p. 34. Others have referred *Omphalia umbellifera* var. *scabriuscula* Pk. to *L. chrysopeplos.* (See White's 2nd Rep. on Hymeniales of Conn., p. 22.) Certain species of Clitocybe, like *C. piceina* are often quite tough, but differ in the gills being discrete from pileus. Again, species of Paxillus might be confused with this genus. It is well for the amateur to compare the prominent characters of these different genera before deciding on a determination. None are reported poisonous; their toughness yields only to thorough cooking. They are hardly to be considered delicacies, but according to McIlvaine may be used to flavor soups. The large *L. lepideus* is often common on railroad ties and cut timber, and doubtless is an important agent in the decay of wood thus attacked.

The key will include also such species as may be looked for in the state. The genus is represented by two sections:

I. Mesopodes.

II. Pleuroti.

Key to the Species

(A) Pileus subentire; stem distinct.
(a) Pileus more or less scaly.
(b) Pileus umbilicate, with blackish-brown scales in the umbilicus; often deformed with aborted gills. 18. *L. tigrinus* Fr.
(bb) Pileus convex, or plane and obtuse.
(c) Pileus commonly rather large, 5-15 cm. broad.
(d) Gills anastomosing on the stem; spores 12-15 x 5-6 micr.; pileus large, at first glabrous. *L. underwoodii* Pk.
(dd) Gills not anastomosing.
(e) Pileus with spot-like, brownish scales, gills sinuate; spores 11-13 x 4-6 micr. 19. *L. lepideus* Fr.
(ee) Pileus rimose-scaly; gills not sinuate; spores 8-10 x 4-5 micr. *L. spretus* Pk.
(cc) Pileus 5 cm. or less in width.
(d) Pileus thin, rufous-tinged, sulcate on margin, 1-2 cm. broad. *L. sulcatus* Berk.
(dd) Pileus thick, obconic, not sulcate; gills long-decurrent. *L. obconicus* Pk.
(aa) Pileus glabrous, not large.
(b) Caespitose, rarely solitary; pileus subinfundibuliform.
(c) Stem furrowed, confluent-caespitose. 23. *L. cochleatus* Fr.
(cc) Stem not furrowed; on the ground. *L. americana* Pk.
(bb) Not caespitose or rarely so; pileus plane, or slightly depressed to umbilicate.
(c) Pileus hygrophanous, umbilicate; stem central or eccentric. 20. *L. umbilicatus* Pk.
(cc) Pileus not hygrophanous.
(d) Pileus reddish-brown; stem whitish; spores minute, globose, 3-4 micr. 22. *L. microsperma* Pk.
(dd) Pileus ochraceous to cream-color; stem short, blood-red to reddish; spores oblong. 21. *L. haematopus* Berk.
(AA) Pileus dimidiate, sessile.
(a) Pileus large, 5-15 cm. broad, imbricate, coarsely hairy and rough-ribbed, flesh-color. 24. *L.vulpinus* Fr.
(aa) Pileus less than 5 cm.
(b) Taste peppery; pileus thick, whitish, becoming reddish-brown, hairy. 25. *L. ursinus* Fr.
(bb) Taste pleasant; pileus thin, whitish or yellowish *L. suavissimus* Pk.

Section I. Mesopodes: Pileus subentire, stem distinct.

**Pileus scaly. Provided when young with a veil.*

18. Lentinus tigrinus Fr.

Syst. Myc., 1821. (As *Omphalia tigrina.*) Epicrisis, 1836-38.

Illustrations: Patouillard, Tab. Analyt., No. 406.
Ricken, Blätterpilze, Pl. 26, Fig. 2.
Gillet, Champignons de France, No. 406.
Cooke, Ill., Plate 1138 and 1139.
Lyman, G. R. Proc. Boston. Soc. Nat. Hist., Vol. 33, Plate

23 et al. (Illustrating the abnormal form, *Lentodium squamulosum.*)

PILEUS 2-5 cm. broad, fleshy-leathery, at first orbicular, convex then plane and *umbilicate,* white but covered, especially at the center, with *blackish-brown,* hairy scales, margin at length wavy and often split. FLESH white, *thin.* GILLS *decurrent,* somewhat narrow, close, white, edge eroded-serrate. STEM 1-3 cm. long, slender, tapering downward, *solid,* minutely scaly, whitish, white within, often darker at base. At first with a delicate *veil,* which may form an evanescent annulus. SPORES elliptical-oblong, 6-7 x 3-3½ micr., smooth, white in mass, often copious.

Gregarious. On dead wood, which is usually hard. Ann Arbor, New Richmond. September. Infrequent.

The umbilicate, thin, pileus, different scales, and much shorter spores, distinguish it from *L. lepideus.* It is at first soft, but becomes coriaceous in dry weather. Ricken gives the spore-length almost twice that of the American plants.

A monstrous form occurs, which is often more common than the normal form or may be the only one found. This was placed by Morgan in a new genus, *Lentodium squamulosum.* Prof. Lyman raised this form in the laboratory from spores and considered it definitely distinct from *L. tigrinus,* as indeed his results strongly indicate. (See reference above to Lyman's paper.) Peck, however (N. Y. State Mus. Bull. 131), points out that the monstrosity and *L. tigrinus* itself appear on the same log and considers this to show that they are one and the same. Lyman never obtained the normal form from his cultures of spores from basidia of Lentodium.

The collection which I made at New Richmond was observed for several weeks, and all stages were seen on the same pieces of wood lying on the ground, both the perfect form with regular gills, and the deformed form. The latter has the gills obliterated by an overgrowth of mycelium, so that the under side of the pileus presents an even surface, much as in one form of *Nyctalis asterophora.* In the light of Lyman's researches, this form must be considered as a regular variation of this mushroom, whose tramal hyphae may produce basidia and spores without the development of true gills. The monstrosity often becomes quite hard and woody in dry weather and is unique among our fungi.

19. Lentinus lepideus Fr. (Edible)

Syst. Myc., 1821. (As *Omphalia lepidea.*) Epicrisis, 1836-38.

Illustrations: Hard, Mushrooms, Fig. 182, p. 228, 1908.
Marshall, Mushroom Book, p. 56, 1905.
Freeman, Minn. Plant Diseases, Fig. 116, p. 237. 1905.
Cooke, Ill., Plate 1140.
Gillet, Champignons de France, No. 405.
Plate VI of this Report.

PILEUS 5-15 cm. or more broad, *compact and firm,* toughish, regular or irregular, *convex or obtuse,* at length plane, buff to pale ochraceous, variegated with subconcentric, brownish, adpressed, *spot-like scales,* even or sometimes areolate-cracked. FLESH white, pliant when fresh, hard when dry. GILLS decurrent, *sinuate behind,* broad, subdistant behind, close in front, white, often ferruginous-stained, transversely rivulose or striate, serrately-eroded, *covered when young by a membranous white* VEIL. STEM short, 2-5 cm. or longer, 1-2½ cm. thick, stout, solid, *hard,* pointed at base, *scaly,* irregular in cross-section, at first ringed at apex by the veil. SPORES elongated-oblong, 10-13 x 4-5½ micr., smooth, white. ODOR pleasant, rather faint.

Solitary or somewhat caespitose. On old timbers of bridges, side walks, railroad ties, fence posts, or on sun-exposed logs, stumps, etc., in woods, preferably on wood of conifers, hemlock, pine, tamarack, but also on oak, etc.

Throughout the state. May-October. Common. Edible when young.

A species has been segregated from this one by Peck, who has described a new form with gills which are decurrent but not sinuate and which has spores 7½-10 x 4-5 micr., under the name *Lentinus spretus.* It has a more slender habit, thinner pileus, and smaller scales. This doubtless occurs also with us. *Lentinus lepideus,* in the happy phrase of McIlvaine, "is a sort of commercial traveler." It is found everywhere on railway ties, whose decay it accelerates. Its ability to grow in rather dry situations makes it a dangerous enemy of exposed timbers, especially of coniferous wood. Specimens found on old tamarack logs measured 20 cm. across the pileus, and had a well developed veil which formed a membranous ring at the apex.

***Pileus glabrous; veil lacking.*

20. Lentinus umbilicatus Pk.

N. Y. State Mus. Rep. 28, 1876.

Illustration: Ibid, Plate I, Fig. 15-19.

PILEUS 1-2 cm. broad, tough, convex, *with a deep umbilicus, hygrophanous,* water-brown, (moist), fading, glabrous, even. FLESH thin. GILLS adnate or slightly decurrent, close, broadest behind, narrower in front, whitish, edge serrate. STEM 1-2½ cm. long, 2-3 mm. thick, equal or tapering upward, glabrous, *stuffed or hollow,* tough, *slightly wrinkled or lacunose,* central or eccentric, concolor or paler. SPORES broadly elliptical, 6 x 3.5-4 micr., smooth, white. ODOR none. TASTE tardily acrid.

Gregarious. On the ground, among leaves, in mixed woods of pine, beech, etc. New Richmond. September. Rare.

This little Lentinus has the habit of a Clitocybe. Our specimens had a central stem and grew from the ground. It is, however, said to grow on wood, where it has an eccentric stem. Its serrate gills and tough texture separate it from Clitocybe. It is close to *L. omphalodes* Fr. and may be its American form.

21. Lentinus haematopus Berk.

Grevillea, 1872.

PILEUS 2-5 cm. broad, orbicular or wider than long, sometimes lobed, *umbilicate or depressed,* pale or sordid yellow, glabrous, even. FLESH tough, whitish, tinged yellow, *thin.* GILLS decurrent, narrow, subdistant, white to dull yellowish, edge toothed to nearly entire. STEM short, 4-6 mm. long, 2-4 mm. thick, *eccentric to sublateral,* firm, glabrous *blood-red* or *reddish.* SPORES oblong-elliptical, inequilateral, 7-9 x 3 micr., smooth, white. CYSTIDIA none. ODOR aromatic-pleasant. TASTE bitterish.

Solitary. On wood. Ishpeming. August. Rare.

The specimen from which most of the above description was made, was sent to Peck who identified it as this species. It was first sent to Berkeley from an unknown locality in North America. Peck reports it twice from New York. In our plant the pileus is laterally extended on the short sublateral stem, and the gills and

flesh have a distinct dull yellow tinge. It was found in mixed woods in the Northern Peninsula.

22. Lentinus microsperma Pk.

Torr. Bot. Club. Bull. 33, 1906.

PILEUS 3-5 cm. broad, thin, convex, *obtuse,* soft-pliant, glabrous, even, *brownish-tan*, darker on disk, margin spreading. FLESH white, thin. GILLS adnexed-emarginate, rather narrow, attenuate in front, close, white, becoming dingy creamy-yellowish, *edge lacerate-crenulate.* STEM 3-6 cm. long, 4-10 mm. thick, varying slender or rather stout, *hollow,* terete or compressed, eccentric, sometimes grooved, glabrous, equal, whitish. SPORES minute, globose, 3-4.5 micr., smooth, white. CYSTIDIA none. BASIDIA clavate, about 25 x 5 micr. TASTE bitterish.

Caespitose. On decayed wood. New Richmond. September. Rare.

This species was first sent to Peck from Missouri. It seems to be quite distinct although rare. I have collected it but once.

23. Lentinus cochleatus Fr. (Edible)

Syst. Myc., 1821. (As *Omphalia cochleata.*) Epicrisis, 1836-38.

Illustrations: Gillet, Champignons de France, No. 403.
Ricken, Blätterpilze, Pl. 26, Fig. 1.
Patouillard, Tab. Analyt., No. 126.
Cooke, Ill., Plate 1142.
Hard, Mushrooms, Fig. 183, p. 229, 1908.

PILEUS 2-5 cm. broad, tough, flaccid, *irregularly-compressed or lobed,* variable in shape, *depressed to infundibuliform,* glabrous, pale reddish ochraceous to brownish-isabelline. FLESH thin, whitish. GILLS decurrent, rather broad, close, whitish tinged flesh-color, edge serrate. STEM 3-7 cm. long, 3-7 mm. thick, glabrous, central, eccentric or sublateral, *confluent at base, deeply sulcate,* solid, variously and irregularly thickened, concolor. SPORES minute, subglobose, 4-5 micr. diam., smooth, white in mass. ODOR somewhat aromatic.

Confluent-caespitose, in dense tufts. On stumps, decaying wood of birch, ash, chestnut, etc., sometimes on wood buried in the ground, in mixed and frondose woods. Throughout the state. July to September. Common locally.

The densely tufted furrowed stems and irregular one-sided vase-shaped pilei distinguish this at once. Often there are many short undeveloped pilei around the base of large tufts. The plant is rare in some localities, and in others it may be very plentiful.

Section II. Pleuroti. Stem lateral or none. Pileus dimidiate.

24. Lentinus vulpinus Fr.

Epicrisis, 1836.

Illustrations: Atkinson, Mushrooms, Figs. 128, 129, p. 134-5, 1900.
Hard, Mushrooms, Plate 26, Fig. 181, p. 227, 1908.
Fries, Icones, Plate 176.

PILEUS 5-15 cm. broad, sessile, multiple-imbricated, conchate-reniform, joined at their bases, *coarsely hairy or scrupose, radiately rough ribbed,* flesh color to alutaceous, margin strongly incurved. FLESH rather thin, tough-fleshy, whitish. GILLS decurrent, broad toward front, *narrowed, to the base of the pileus,* crowded, simple, white or tinged flesh color, edge coarsely serrate. SPORES subglobose, 3-4 x 2-3 micr., very minute, smooth, white in mass, copiously shed on the pilei. ODOR and TASTE rather strong, pungent.

Densely connate-imbricate. On decaying logs, stumps and trunks of various deciduous trees. Ann Arbor, Detroit, New Richmond, Houghton, Marquette. Records from July 25-Oct. 19. Infrequent.

It reappears on the same log in successive years. The very rough and peculiarly colored pileus is not easily mistaken. It grows in shelving masses of many individuals, almost equalling *Pleurotus ostreatus* in this respect, and is by far the largest of the dimidiate species of the genus.

25. Lentinus ursinus Fr.—Bres.

Syst. Myc., 1821. (As Pleurotus.))

Illustration: Bresadola, Fung. Trid., Vol. 1, Pl. 66.

PILEUS 1-4 cm. broad, *sessile,* ascending, subimbricate, subreniform, convex, *pale reddish-brown,* varying glabrous to sub-tomentose, even, fading. FLESH thickish, very thin on margin, toughish. GILLS subdecurrent or radiating from the stem-like base, *rather broad,* close, dingy white to whitish-alutaceous, *edge lacerate-dentate.* SPORES *spheroid,* 5.5 x 4 micr., almost smooth, white.

CYSTIDIA none. ODOR mild. TASTE none or slightly disagreeable.

On prostrate trunks in woods of beech and hemlock. New Richmond. September. Infrequent.

Known by the sessile, rufous-brown pileus, which is somewhat tomentose or at least pruinose behind. Fries (Monographia) gives the size of the pileus as about 7 cm. broad; our plants agree better with Bresadola's description, averaging even smaller. Peck (N. Y. State Bull. 131) reports the larger-sized plant but says the taste is acrid and the margin of the pileus costate-corrugate.

Marasmius Fr.

(From the Greek, *maraino,* to wither or shrivel.)

White-spored. Flesh tough, arid, shriveling in dry weather, *reviving again in wet weather.* Stem central, confluent with the pileus, but of different texture, often horny. Veil none. Gills arid.

Terrestrial or lignicolous, frequently on midribs or veins of fallen leaves, on grass, etc. Except in the texture of the pileus, it is similar and closely related to the genera Collybia and Mycena, and with the same habit. A few are highly prized for the table. *M. oreades,* is one of our best-flavored mushrooms, especially delicious when used in gravy or soups. *M. scorodonius,* because of its garlic flavor, is used to season various dishes, although *M. alliaceus* which has the same odor is mentioned as not edible. The latter has not been found with us so far. Several are reported as poisonous, e. g., *M. urens* and *M. peronatus.* It is worth while to become acquainted with *M. oreades,* even if one goes no further. The genus is a large one, comprising over four hundred and fifty species, of which the larger part occur in the tropics.

The PILEUS is not putrescent, as it is in Collybia and Mycena, but is composed of a toughish substance which revives in wet weather and this is a fundamental character by which this genus along with Panus, Lentinus and Schizophyllum is to be separated from the Agarics with a putrescent pileus. The size is similar to that of the species of Mycena. It is usually soon expanded as in Collybia and may be depressed or umbilicate. The two main groups correspond, with regard to the position of the margin in the young plant, to Collybia and Mycena respectively, and have the same name. The GILLS are arid, flexible, almost leathery at times, often crisped on drying, the edge entire. They are sometimes joined behind in

the form of a collar which loosens (secedes) from the stem. Often they are almost free, or, when adnate or adnexed they have a tendency to secede. It is often confusing to find that authors use the term "free" or "becoming free," when they mean that the gills become loosened from the stem after they have been attached. It is better to use the term "secede" and retain "free" for the usual purpose of indicating that they never were attached to the stem. In the smaller species the gills are often few and therefore very distant. The width is often quite reliable to separate species, although in some it varies. The STEM is cartilaginous or horny; in a few, e. g., *M. orcades* it is merely tough-fibrous or with a subcartilaginous cuticle. The nature and presence or absence of the villose, tomentose, etc., covering of the stem is used to distinguish some of the sections. The mode of attachment to the substratum, whether rooting or instititious, also helps to separate the subdivisions. Many of the smaller species have a black stem, and usually the color of the stem in most species is darker below and paler or white at the apex. With the exception of a small number of our species, like *C. oreades, C. urens, C. peronatus* and *C. subnudus,* the stem is hollow or slightly stuffed at first. In the small species the stem is almost bristleform and inserted by the attenuated base. The SPORES are white in mass, hyaline under the microscope, varying in shape from subspheriod to lanceolate. The majority have a similarity in form which is rather striking: round-enlarged at one end and tapering to a pointed apiculus at the attached end. The reviving ability of the gills explains the variability in size which is found at different times in separate plants of the same species. One must be cautious in taking the spore-measurements as in some cases it is clear that the spores continue to grow after the plant is revived by rains. CYSTIDIA are rarely present. In *M. cohoerens* they occur in great abundance in the form of relatively large brown spicules of the same kind as occur on the surface of the pileus and stem. In *M. delectans* they are colorless. The ODOR is strong and often like garlic as in *M. scorodonius, M. prasiosmus, M. polyphyllus* and *M. calopus.* In *M. foetidus* it is very disagreeable, but not of garlic. The TASTE is acrid or bitter in a few species, otherwise not important.

The arrangement of species is that of Fries. Until the development is carefully studied for each species, any new arrangement is likely to be unsatisfactory. The genus is divided into two subgenera: Collybia and Mycena with the following sections:

I. COLLYBIA
- (1) Scortei
- (2) Tergini
- (3) Calopodes

II. MYCENA
- (4) Chordales
- (5) Rotulae

Key to the Species

(A) Stem velvety, tomentose, floccose, pruinose or minutely pubescent, at least downwards. [See (AA).]
- (a) Gills arcuate-decurrent; plant glandular-pubescent, white. 41. *M. resinosus* Pk.
- (aa) Gills not decurrent, sometimes uncinate.
  - (b) Stem rooting or attached by a floccose or strigose base.
    - (c) Plants with a strong odor.
      - (d) Odor like garlic.
        - (e) Pileus 3-5 cm. broad; gills very crowded; spores 5-6 x 3-4 micr. 37. *M. polyphyllus* Pk.
        - (ee) Pileus 1-2.5 cm. broad; gills not crowded; spores 12-15 x 3-4 micr. 36. *M. prasiosmus* Fr.
      - (dd) Odor very disagreeable, not of garlic. Pileus umbilicate, plicate-striate. 43 *M. foetidus* Fr.
    - (cc) Plants not ill-smelling.
      - (d) Taste acrid or bitterish; pileus 2-5 cm. broad, brownish-red to alutaceus.
        - (e) Stem clothed everywhere by a whitish or grayish pubescence.
          - (f) Taste bitter; spores 10 x 4.5 micr. 29. *M. subnudus* (Ellis) Pk.
          - (ff) Taste acrid; spores 7-8.5 x 3.28. *M. urens* Fr.
        - (ee) Stem with yellow strigose hairs towards base; taste acrid. 27. *M. peronatus* Fr.
      - (dd) Taste not acrid nor bitter.
        - (e) Stem solid; plants growing in rings in grassy places, dull reddish-brown to dull yellowish. 26. *M. oreades* Fr.
        - (ee) Stem stuffed or hollow.
          - (f) Stem dark blood-red within; gills very crowded and narrow; pileus red-brown. 38. *M. varicosus* Fr.
          - (ff) Stem not with blood-red flesh.
            - (g) Gills soon reddish-brown from abundant dark-colored cystidia; stem horny, bay brown, subvelvety. 46. *M. cohaerens* Fr.
            - (gg) Gills without brown cystidia.
              - (h) Pubescence or tomentosity of stem dark-colored, brown, reddish, tawny or blackish, especially downward.
                - (i) Pileus subzonate, umbilicate, tawny-hairy like the stem. (828. *Collybia zonata.*)
                - (ii) Pileus not zonate, glabrous.
                  - (k) Growing on bark of grape-vines; pileus 2-3 cm. broad, sulcate-striate. 30. *M. viticola* B. & C.
                  - (kk) Growing among fallen leaves in woods.
                    - (l) Stem spongy-thickened at base; gills broad; pileus fuscous-pallid. 32. *M. spongiosus* B. & C.
                    - (ll) Stem equal.

(m) Stem minutely pruinose, horny, almost black below; pileus dark rose-madder. 39. *M. erythropus* Fr. var.
(mm) Stem densely tomentose.
(n) Stem dark reddish-brown throughout, 2-8 cm. long, 35. *M. semihirtipes* Pk.
(nn) Stem brown or fawn color, 5-12 cm. long. 47. *M. elongatipes* Pk.
(hh) Pubescence etc. of stem grayish or whitish, at least when dry.
(i) Growing on tree-trunks, bark, stumps, logs, etc.
(k) Slender; pileus 1-1.5 cm. broad, papillate, dull pinkish-white; on mossy logs. 48. *M. papillatus* Pk.
(kk) Short-stemmed; pileus 1-3 cm. broad, fulvous-alutaceus; caespitose-gregarious. 31. *M. fagineus* Morg.
(ii) Among fallen leaves, etc., in woods; stem 5-12 cm. long.
(k) Stem 2-5 mm. thick, reddish under the dense whitish pubescence; gills very narrow and crowded. (See 827 *Collybia confluens* Fr.)
(kk) Stem 1-2 mm. thick; covered with grayish pruinosity or tomentose.
(l) Gills very narrow and crowded, whitish or grayish. 40. *M. velutipes* B. & C.
(ll) Gills distant, at length reddish-spotted. 47. *M. chordalis* Fr.
(bb) Stem inserted at the base, instititious, short; plants small.
(c) Gills attached to a collar, distant; pileus rufescent; stem white. 44. *M. olneyi* B. & C.
(cc) Gills attached to stem.
(d) Pileus glabrous, rarely subpruinose.
(e) Pileus milk-white, not sulcate nor plicate; gills distant; stem reddish-brown. 54. *M. epiphyllus* Fr.
(ee) Pileus rufescent, striate when dry; stem brownish to blackish-brown. 50. *M. felix* Morg.
(dd) Pileus pruinose, chalk-white, stem black, white pruinose on surface; spores angular. (See 56. *Heliomyces nigripes* (Schw.) Morg.)
(ddd) Pileus hairy or strigose-hairy.
(e) On cedar twigs; pileus conic, papillate, dark tawny. (See 830 *Collybia campanella* Pk.)
(ee) On twigs, chips, acorns etc; pileus umbilicate; whitish to dark grayish. (See 829 *Collybia stipitaria* Fr.)

(AA) Stem glabrous (except sometimes at the very base).
(a) Stem villose-rooting or attached by a floccose tubercle.
(b) Gills soon reddish-brown from the dark-colored cystidia; stems usually coherent, bay-brown, densely white-hairy at base. 46 *M. cohaerens* (Fr.) Bres.
(bb) Gills white or slightly tinged.
(c) Stem 4-8 cm. long; pileus sulcate, ochraceus-red; spores large. 49. *M. siccus* Schw.=(*M. campanulatus* Pk.)
(cc) Stem 2-5 cm. long.
(d) Pileus, gills and apex of stem white, stem dark-brown below, attached by a spreading mycelium. 34. *M. delectans* Morg.
(dd) Pileus not white.
(e) Stem reddish-brown to chestnut downwards; pileus dingy ochraceus. 33. *M. glabellus* Pk.
(ee) Stem wine-purple or pink upwards; pileus tawny-brown to purplish or pink. 33. *M. bellipes* Morg.

(aa) Stem inserted at the naked base, very slender; on twigs, leaves etc.
(b) Odor more or less strong, of garlic; pileus rufous to whitish.
(c) Gills adnate, narrow; stem attenuated at the blackish base. Odor strong. 42. *M. scorodonius* Fr.
(cc) Gills adnexed, rather broad; odor faint; stronger as plant dries. 42. *M. calopus* Fr.
(bb) Odor not of garlic.
(c) Gills attached to a free collar.
(d) Pileus umbilicate, plicate on sticks, wood, etc., filiform.
(e) Umbilicus white, elsewhere cap is darker; stem black. 55. *M. capillaris* Morg.
(ee) Umbilicus darker, cap white; stem black. 51. *M. rotula* Fr.
(dd) Pileus umbonate, sulcate, pale rufous; stem black, on grass. 52. *M. graminum* Libert.
(cc) Gills adnate or adnexed.
(d) Plant entirely white; pileus obtuse, 4-8 mm. broad, stem very short. 45. *M. caricicola* Kauff.
(dd) Pileus reddish-brown-purplish, umbilicate; stem black. 53. *M. androsaceus* Fr.
(ddd) Pileus fuscous-cinereous; stem short; on bark of living tree-trunks. (See 845. *Mycena corticola.*)

SUBGENUS COLLYBIA. Margin of pileus at first incurved; stem somewhat cartilaginous; pileus fleshy-pliant, at length tough and sulcate or wrinkled.

Section I. Scortei. Stem *solid or fibrous stuffed,* externally covered by a *detersile villosity,* i. e., an easily removable villosity.

**Stem not strigose at the base.*

26. Marasmius oreades Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1118.
Gillet, Champignons de France, No. 444.
Patouillard, Tab. Analyt., No. 328.
Hard, Mushrooms, Figs. 101 and 102; p. 136, 1908.
Gibson, Our Edible Toadstools and Mushrooms, Pl. 8, p. 105, 1903.
Swanton, Fungi, Pl. 9, Fig. 3.
Murrill, Mycologia, Vol. 2, Pl. 19, Fig. 3.
White, Conn. State Geol. & Nat. Hist. Bull. 15, Pl. 4, 1910.
Peck, N. Y. State Mus. Rep. 48, Pl. 33, Fig. 7-12, 1896.

PILEUS 2-5 cm. broad, *thickish,* pliant, campanulate-convex, obtuse or broadly umbonate, dull brick-red when young or moist, fading to yellowish-flesh-color, or yellowish-buff when dry, glabrous, even or substriate when moist. FLESH rather thick on disk, pallid.

GILLS rounded behind or almost free, *broad,* rather distant, whitish or tinged yellowish, interspaces often venose. STEM 3-7 cm. long, 3-5 mm. thick, equal, *solid,* even, tough, whitish, covered with a fine, interwoven, dense, detersile, villosity. SPORES ovate-fusiform, 7-9 x 4-5 micr., smooth, white. ODOR somewhat fragrant, agreeable. TASTE pleasant.

Gregarious, usually growing in rings or arcs, in grassy places, lawns, roadsides, pastures, etc., attached to grass, or roots of other plants. Throughout the state, more abundant in sandy regions. June-October. Common.

One of our best edible mushrooms, and very plentiful in some localities during a wet season. Its flavor is delicious and it can be used for this reason to add character to other dishes. Its toughness disappears by long cooking, a reversal of what happens in the case of many other species. When dry from sun or wind, its pale-honey-yellowish color and reviving ability are good marks of recognition; its tendency to form circles of close-growing individuals and its preference for grassy ground aid one to recognize it. Its gills are scarcely as arid as in other species of Marasmius, and this character, along with its fleshy cap indicate a close relationship with Collybia. The "fairy rings" caused by this and other mushrooms are due to the regularity of radial growth which the underground mycelium makes from year to year, starting from a central infection. It is believed by some that this mycelium excretes a substance which injures the grass so that the interior of the circle shows a poor growth of grass, but on the other hand some favorable influence from the actively growing portion along the "ring" causes the grass of this portion to grow better.

***Stem with a woolly or strigose base.*

27. Marasmius peronatus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 25, Fig. 1.
Cooke, Ill., Pl. 1117 (var.).
Gillet, Champignons de France, No. 445.
Berkeley, Outlines, Pl. 14, Fig. 4.
Patouillard, Tab. Analyt., No. 411.
Gibson, Our Edible Toadstools and Mushrooms, Pl. 9, p. 111, 1903.
Hard, Mushrooms, Fig. 112, p. 149, 1908.

"PILEUS 2-6 cm. broad, convex-plane, obtuse. opaque, pliant, pale reddish-brick color fading to alutaceus, at length lacunose. *margin striate at first,* wrinkled when old. FLESH thin, leathery-membranaceus. GILLS adnexed-seceding, rather thin, at first whitish then rufescent, close to subdistant. STEM 5-8 cm. long, 2-4 mm. thick, fibrous-stuffed, subequal, sometimes compressed, with a villose covering, yellowish then rufescent, *toward base with yellow strigose hairs.* SPORES oval, 6-8 x 3-5 micr., smooth, white. ODOR none. TASTE *acrid."*

Gregarious on the ground among leaves and sticks in frondose and coniferous woods. Probably throughout the state. July-October. Infrequent.

The description is adapted from Saccardo. This species seems less common with us than *M. urens.* Its acrid taste, habit, and the yellow hairs on the lower part or base of stem are good characters for its indentification. Its size corresponds to that of *Collybia dryophila.* The stem is said sometimes to become hollow. It is said to be poisonous.

28. Marasmius urens Fr. (Poisonous)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1116.
Gillet, Champignons de France, No. 448.
Berkeley, Outlines, Pl. 14, Fig. 3.
Gibson, Pl. 9, p. 111.
Plate VII of this Report.

PILEUS 2-5 cm. broad, at first convex, then almost plane, obtuse or subumbonate, reddish-brown to alutaceus, darker on center, *at first even,* at length wrinkled, glabrous, opaque, pliant, margin at first incurved. FLESH thin, toughish-membranaceus. GILLS becoming free, at length remote, joined behind in places, thickish, subintervenose, *close,* at first crowded, narrow, whitish or pallid then tinged reddish. STEM 4-8 cm. long, 1-3 mm. thick, equal, *solid, terete,* pale reddish-brown, paler above, almost blackish at base, *covered throughout by a close, white pubescence,* composed of cohering minute hairs, whitish within, attached by an oblique substrigose base. SPORES oblong-lanceolate, slightly curved, 7-8.5 x 3 micr. CYSTIDIA none. ODOR none. TASTE *acrid; poisonous.*

Gregarious or scattered, on the ground in frondose woods, among leaves, debris and grass. Ann Arbor. July-October.

This species is considered identical with the preceding by Ricken, Massee and Romell. Even Fries was loath to separate it, and considered it a var. of *M. peronatus*. (See note under *M. urens*. Epicrisis, p. 373.) According to McIlvaine, *M. peronatus* is edible, while *M. urens* is marked poisonous. If the two are identical this can hardly be true. There is a remote possibility that *Collybia hariolorum* has been confused with *M. peronatus* while testing its edibility. In any case one needs to be careful. *M. urens* if distinct, seems more abundant locally than *M. peronatus*. The latter alone seems to have been differentiated by Peck, who does not report the first. Moffatt (Nat. Hist. Surv. Chicago) reports only *M. urens* and says it is frequent. Morgan (Myc. Flora. Miam.) reports both.

29. Marasmius subnudus (Ellis) Pk.

N .Y. State Mus. Rep. 51.

"PILEUS 2-5 cm. broad, convex or *nearly plane*, glabrous, tough, flexible, often somewhat irregularly uneven, *dull brownish red or dingy bay,* more or less striate on margin. FLESH thin. GILLS rounded behind, nearly free, narrow, *subdistant, whitish or creamy-yellow,* becoming darker on drying. STEM 4-8 cm. long, 2-4 mm. thick, slender, equal, tough, *inserted, solid,* reddish-brown above, blackish-brown below, everywhere clothed with a *grayish* down or tomentum, which is commonly a little more dense near the base. SPORES 10 x 4.5 micr. (Pennington.) TASTE of dry plant bitter."

On the ground in mixed woods. New Richmond, Ann Arbor. August-September.

This is apparently a variety of the preceding, if that species is distinct, and not of *M. peronatus* as Ellis considered it. It is probable that all three run into each other. The description is that of Peck. Our plants had a bitter taste when fresh, otherwise not very different from *M. urens* Fr. Glatfelter (Trans. Acad. Sci. St. Louis, Vol. 16) gives spores 6-8 x 4-5 micr. which agree with those of *M. urens.*

30. Marasmius viticola B. & C.

Ann. & Mag. N. H., 1859.

PILEUS 1-3 cm. broad, convex-expanded, at length depressed, *sulcate-striate,* pale rufous to alutaceus-brownish, glabrous. FLESH thin, subcoriaceus. GILLS slightly adnate, not broad, ventricose,

subdistant, pallid or tinged alutaceus. STEM 2-4 cm. long, 1-2 mm. thick, equal, tough, *pruinose-furfuraceus,* stuffed, *dark brown,* slightly enlarged and curved at very base. SPORES ovate-lanceolate, 8-9 x 3-4 micr., smooth, white. ODOR none. TASTE mild.

Gregarious or scattered, on rotten wood, debris, etc. Infrequent.

This is referred here with some hesitancy, although it is clearly distinct from the following, which differs in its subcaespitose habit, its short stem and long spores. It was named by Berkeley from material sent him by Curtis who collected it from grape-vines in Alabama.

31. Marasmius fagineus Morg.

Cinn. Soc. Nat. Hist. Jour., Vol. VI., 1883.

PILEUS 1-3 cm. broad, at first convex-campanulate, then plane, obtuse, pliant, striatulate when moist, radiately rugose when dry, *at length repand, pale fulvous-alutaceus,* appressed-silky, sometimes scaly-lacerate, margin at first incurved. FLESH thin, submembranaceus. GILLS narrowly adnate, seceding, rounded and subjoined behind, close, not broad, attenuate in front, crisped, whitish at first, *becoming brown—spotted or stained reddish,* edge subentire. STEM *short,* 1-2 cm. long, 1-2 mm. thick, *curved,* sometimes straight, subequal, *apex enlarged,* with a narrow stuffed axis, terete when fresh, compressed when dry, rufous or chestnut-alutaceus, fading to fuscous-alutaceus, apex paler, *covered by a whitish, villose tomentosity when dry,* strigose brownish-hairy where attached. SPORES subcylindrical, narrow, with curved apiculus, 9-12 (rarely 13) x 3.5-4 micr., with many immature of all sizes, smooth, white. CYSTIDIA none. ODOR and TASTE none.

Gregariously caespitose, usually abundant, on bark near base of living elm, beech and maple, or on stumps, etc., sometimes ascending the trunk five to six feet or more. Ann Arbor. July-August. Not infrequent.

Known by its caespitose, crowded habit, short stems, relatively broad pileus and spores. This may be the true *M. viticola,* but that species is poorly known.

32. Marasmius spongiosus B. & C.

Jour. Botany, 1849.

"PILEUS 1-2 cm. broad, plane, obtuse, *whitish-fuscous,* darker on center. GILLS slightly adnate, *broad,* close, whitish. STEM

3.5 cm. long, *thickened at the base* where it is spongy and fulvous-hairy, elsewhere furfuraceus-pulverulent." SPORES 7-9 x 3-4 micr. (Morgan); 4-5x3 micr. (Glatfelter).

Reported by Longyear, as under oak trees among grass. Also said to grow among fallen leaves, and around stumps in rich soil. I have not seen it.

Section II. Tergini. STEM tubular, rooting, cartilaginous. Pileus *hygrophanous.* Gills seceding.

**Stem glabrous except the mycelioid-hairy base.*

33. Marasmius glabellus Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-2 cm. broad, convex-expanded, obtuse, often distantly striate, *dingy ochraceous,* uneven on disk. FLESH membranaceus. GILLS adnate-seceding, *broad, distant,* ventricose, white or whitish, intervenose. STEM 2-5 cm. long, 0.6-1 mm. thick, slender, equal, horny, tubular, *glabrous,* shining, whitish at apex, *reddish-brown or chestnut* elsewhere, mycelioid-thickened at base. SPORES (10x4.5 micr., from one of Peck's collections).

Var. *bellipes*=(*M. bellipes* Morg.) Jour. of Myc., Vol. XI, 1905.

PILEUS *pale tawny-brown to pink-purplish,* distantly sulcate or plicate, subpapillate, glabrous or minutely velvety. STEM with dilated apex, *varying above from whitish to bright wine-purple or pink.* SPORES elliptical oval, curved-apiculate, 10-12x4-5.5 micr., smooth, white. BASIDIA 30-42 x 6 micr., slender. ODOR and TASTE none. (Otherwise like *M. glabellus.*)

Gregarious or scattered, among fallen leaves on the ground in frondose woods. Ann Arbor. August-September. Infrequent.

As no authentic spore-measurements are published, it is impossible to say whether *M. bellipes* is entirely distinct. The latter, however, seems to be the form that occurs in our region. Inasmuch as the plant, as it occurs here, varies considerably in color, it would not be surprising if Peck's species had the colors mentioned for both. The variety is a beautiful plant when in the fresh state, due to the highly colored stem. *M. pulcherripes* Pk. differs from the latter apparently only in its narrow gills and very filiform stem; the spore-size is not given.

34. Marasmius delectans Morg.

Jour. of Myc., Vol. XI, 1905.

Illustration: Hard, Mushrooms, Fig. 114, p. 151, 1908.

PILEUS 1-2 cm. broad, pliant, convex-expanded, depressed or subumbonate, glabrous, *white or whitish,* pale tan in age, rugulose-striate. FLESH subcoriaceous. GILLS adnexed, unequal, moderately broad, *subdistant, white,* intervenose. STEM, 3-5 cm. long, 1-1.5 mm. thick, *slender,* equal, even, hollow, cartilaginous-tough, *glabrous, shining, pure white above,* darker downwards, to dark brown below, *mycelioid at base,* mycelium forming wide, white mats over the fallen leaves where it grows. SPORES narrow elliptical, 7-9x3-4 micr., smooth, acuminate-apiculate, white. CYSTIDIA rather abundant on sides, especially on edge of gills, slender, spine-like, 36-45x3-5 micr. ODOR and TASTE mild.

Among fallen leaves in mixed and frondose woods. Ann Arbor, New Richmond. August-September.

Easily known by the white, mycelioid mats which it forms among the leafy covering of the ground in woods, by the white color of the cap and gills and apex of stem, and by its shining stem. It is quite frequent during continued rainy weather.

***Stem glabrous at apex only.*

35. Marasmius semihirtipes Pk.

N. Y. State Mus. Rep. 25, 1873.

Illustration: Conn. State Geol. & Nat. Hist. Surv., Bull. 15, Pl. 6.

PILEUS 2-3 cm. broad, pliant, tough, convex, soon plane, or depressed, glabrous, hygrophanous, even or rugulose, *reddish-brown when moist,* fading to pale alutaceus, disk darker. FLESH thin, submembranaceus. GILLS adnexed-seceding, rather narrow, close to subdistant, whitish, somewhat intervenose, edge subfimbriate. STEM 2-8 cm. long, 1-1.5 mm. thick, *tough,* subequal, *tubular,* sometimes compressed, substriate, *dark reddish-brown throughout,* glabrous at apex, *densely* velvety-tomentose nearly to apex, tomentum of same color. SPORES ovate, curved-apiculate, 8-9x4-5 micr., smooth, white. ODOR and TASTE mild.

On the ground in frondose or mixed woods among leaves and

debris. Ann Arbor, New Richmond, etc. Probably throughout the state. June-September. Frequent.

Known by the reddish covering of the stem. Hard says the plants are very small, which is scarcely correct. The name is deceptive, since the tomentose covering of the stem more often extends nearly or quite the whole length of the stem and the species could with equal propriety be referred to the next division.

36. Marasmius prasiosmus Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1120.
Gillet, Champignons de France, No. 447.

PILEUS 2-2.5 cm. broad, convex then expanded or depressed, obtuse, *pale brown with tinge of flesh color,* to pale isabelline, rugose-sulcate, glabrous. FLESH submembranaceus, toughish. GILLS adnate, seceding, sometimes with tooth, rather narrow, close to subdistant, *concolor* or paler than pileus, thick somewhat crisped. STEM 5-7 cm. long, 2-3 mm. thick, equal, *hollow,* horny-tough, dilated at apex, *dark rufous-brown downwards,* white and glabrous above, *clothed by a whitish or pallid villosity* which is denser below, attached by incurved or straight base to veins of oak leaves. SPORES narrowly lanceolate, curved, accuminate at one end, 12-15 x 3-4 micr., smooth, white. ODOR *strong, of garlic.*

On midribs of fallen oak leaves, in rich woods. Ann Arbor. September. Infrequent.

This differs from *M. scorodonius* in the villose coating of the stem, and from *M. alliaceus* by its habitat on leaves and by the spores; both of those have a garlic odor. Cooke (Ill.) gives the width of spores as 8 micr., and this appears to have been copied by most authors who give the spore size. Ricken departs from this in assigning to it minute spores, 7 x 4 micr. This last discrepancy points to a different species, and may represent *M. polyphyllus* Pk. in Europe.

37. Marasmius polyphyllus Pk.

N. Y. State Mus. Rep. 51, 1898.

"PILEUS 3-5 cm. broad, convex or nearly plane, even, *whitish to pale reddish,* often reddish brown on disk. FLESH thin. GILLS

adnexed or almost free, *very numerous, narrow, crowded,* pure white. STEM 3-7.5 cm. long, 2-6 mm. thick, equal, *hollow, reddish-brown* clothed below and upwards by *a whitish down or tomentum,* denser at base, sometimes absent at apex. SPORES minute, elliptical, 5-6x3-4 micr. ODOR and TASTE *of garlic,* persistent in the mouth.

"On damp shaded ground. July."

Reported by Longyear. It is evidently related to *M. prasiosmus,* from which it differs markedly in the size of the spores and the crowded, narrow, pure white gills. It approaches Richen's idea of *M. prasiosmus* more closely than the preceding. I have not seen it.

38. Marasmius varicosus Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 1121.

PILEUS 1-2.5 cm. broad, pliant, campanulate then plane, obtuse, sometimes with shallow umbilicus, *at first dark reddish-brown, almost purplish,* opaque, somewhat paler in age, radiately rugulose-striatulate, innately silky. FLESH concolor, slightly fleshy. GILLS adnate-seceding, sometimes sinuate-subdecurrent, *very crowded, very narrow,* whitish at the very first, *soon stained dilute reddish,* finally darker, scarcely reaching margin of pileus. STEM 3-5 cm. long, 1-3 mm. thick, stuffed *soon tubular,* equal above, somewhat spongy-thickened at base, glabrous above or with slight grayish pubescence, *towards base covered by spreading or strigose rusty-fulvous hairs, dark blood-red within,* attached by rooting hairs. SPORES minute, narrowly ovate, 6-8x2.5-3 micr., smooth, white. ODOR none. TASTE slightly acrid or mild.

Gregarious or solitary among fallen leaves and debris in frondose woods. Ann Arbor. September. Infrequent.

Characterized by the dark reddish-umber to purplish pileus, the crowded and narrow gills and the ferruginous covering of the stem. When wet the hairs at the base of stem are almost black. By removing the tomentum of the stem the dark red flesh is revealed beneath. Ricken combines this species with *M. fuscopurpurea* Fr., but our plants certainly fit the old conception of *M. varicosus.* It must not be confused with the black species of Collybia: *C. atrata* has broad gills; *C. plexipes* var. lacks the hairy covering on the stem; *C. expallens* has a farinaceus taste. The interior of the stem

of *M. varicosus* seems to secrete a dark-red juice, but it is quite different from *Mycena haematopoda.*

***Stem, at least when dry, everywhere pruinose-velvety.*

39. Marasmius erythropus Fr. var.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1123.
Gillet, Champignons de France, No. 441.
Patouillard, Tab. Analyt., No. 577.
Patouillard, Tab. Analyt., No. 125 (as *M. calopus*).

PILEUS 1-2.5 cm. broad, hemispheric-campanulate, then plane, obtuse or subumbonate, pruinate, *dark rose-madder,* darker on disk, rugulose when dry, margin at first incurved. FLESH *white,* thin. GILLS narrowly adnate, seceding, *subdistant,* ventricose, *rather broad,* white or tinged ochraceus, scarcely intervenose, edge very entire. STEM 4-5 cm. long, 1-1.5 mm. thick, equal, horny, stuffed then hollow, *dark reddish-brown to blackish below,* tough, flexuous, pallid at apex, *minutely pruinose,* with an enlarged mycelioid base. SPORES elliptical-lanceolate, curved-apiculate, 7-9x3-3.5 micr. CYSTIDIA none. ODOR and TASTE mild.

On decaying leaves and twigs, on the ground in frondose woods, especially of beech. Ann Arbor. July-September. Rare.

This approaches *M. glabellus* and *M. calopus* Fr.; from the former it is separated by its different spores and gills, from the latter by its pruinose stem. Some specimens seem to have an entirely glabrous stem, thus being close to *M. calopus.* The color of pileus does not change. The pileus is not sulcate as in *M. siccus.* It departs from the descriptions of European authors in the spore-size and the less distant gills.

40. Marasmius velutipes B. & C.

Ann. & Mag. N. H., 1859 (N. Y. State Mus. Rep. 23, Peck).

Illustration: Hard, Mushrooms, Fig. 105, p. 140, 1908.

"PILEUS 1.5-3.5 cm. broad convex or expanded, glabrous, grayish-rufous when moist, cinereus when dry. FLESH thin, submembranaceus. GILLS *very narrow, crowded,* whitish or gray. STEM

7-12 cm. long, slender, equal, hollow, *clothed with a dense grayish, velvety tomentum throughout.*"

Peck's description, given above, differs from Berkley's in Saccardo, in that the cap does not have an umbilicus, and in the much longer and slender stem. No spore-measurements are published.

Among fallen leaves in woods, on the ground. Ann Arbor.

Our specimens were verified by Peck. The spores measure 6-7x4 micr., oval to ovate, smooth.

41. Marasmius resinosus (Pk.) Sacc.

N. Y. State Mus. Rep. 24, 1872 (as *M. decúrrens* Pk.).
N. Y. State Mus. Bull. 67, 1903 (as var. *niveus* Pk.).
Sylloge Fungorum, Sacc., Vol. V., p. 522.

PILEUS 5-12 mm. broad, convex, then expanded and depressed, pliant, tough, *dull white,* rarely grayish or tawny, sometimes umbilicate or subinfundibuliform, *even or subrugulose, glandular-pubescent.* FLESH thin, submembranaceus. GILLS *arcuate-decurrent,* close to subdistant, *narrow,* white or whitish, often veined or forked, edge flocculose. STEM 2-5 cm. long, 0.5-1 mm. thick, slender, equal, tough, cartilaginous, *glandular-pruinose,* tubular, not striate, white then pallid, *attached by floccose base,* rarely confluent. SPORES oval-lanceolate, 6-7x3-4 micr., smooth, white. STERILE CELLS on edge of gills numerous, narrowly clavate, obtuse, 30x6-7 micr. ODOR and TASTE mild.

Gregarious or subcaespitose, attached to grass, sticks, leaves, etc., in frondose woods. Ann Arbor. July-September. Frequent locally after heavy rains.

The pubescence of cap and stem is due to minute, short hairs which are often glandular-tipped as seen under the microscope. When rubbed between the fingers the fresh plant feels resinous. The decurrent gills suggest an Omphalia, but the reviving and tough substance of the plant are characteristics which place it here. It was first named *M. decurrens* by Peck, who happened on specimens which were not at all typical as to the color of the cap. Saccardo changed the specific name to *resinosus,* because *decurrens* was preoccupied. Later, Peck named the common form var. *niveus,* which still later he changed to var. *candidisimus.* All these names should be dropped, since the plant is practically always white.

Section III. Calopodes. Stem *instititious,* (i. e., inserted, the mycelium hidden), short, not rooting.

**Stem entirely glabrous.*

42. Marasmius scorodonius Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1125.
Ricken, Blätterpilze, Pl. 24, Fig. 6.
Hard, Mushrooms, Fig. 109, p. 144.
Michael, Führer f. Pilzfreunde, Vol. II, No. 44 (as *M. alliatus*).

PILEUS 5-12 mm. broad, pliant, convex then plane, margin at length elevated, rufous-tinged at first, *then whitish, glabrous,* wrinkled in age, crisped on margin. FLESH thin, membranaceus. GILLS *adnate, narrow,* close to subdistant, whitish, crisped, edge minutely flocculose. STEM 2-3 cm. long, 1-2 mm. thick, tapering downward, horny, tubular, terete or compressed, reddish, apex whitish, glabrous, *inserted by the naked, blackish base, somewhat shining.* SPORES narrowly oval-lanceolate, pointed-apiculate, 6-8x3-4 micr., smooth, white. ODOR, when bruised, *strong of garlic.*

Attached to base of grass, herbs and rootlets in fields, roadsides, grassy places in or near woods. Ann Arbor, New Richmond, etc. Probably throughout the state. June-September. Infrequent, but abundant locally.

Var. *calopus* (*M. calopus* Fr.).

Syst. Myc., 1821.

Illustration: Plate VIII of this Report.

PILEUS 5-10 mm. GILLS *adnexed, rather broad,* emarginate, subdistant. STEM 2-3 cm. long, 1 mm. thick, reddish-bay color below, pallid-brownish above. ODOR *faint or none,* more noticeable when drying. (Spores, etc., same as *M. scorodonius.*)

Attached to grass stalks, etc., in woods. Ann Arbor.

M. scorodonius is known by its glabrous, tapering stem, narrow gills and strong odor when the plant is crushed. *M. calopus* is considered identical by some, but its slight odor, and different gills show it to be at least a variety. Hard's figure scarcely represents either plant as it occurs here. This species has long been used in

Europe as a seasoning for mutton-roasts, for other mushrooms and gravies.

****Stem minutely velvety or pruinose.***

43. Marasmius foetidus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1134.
Gillet, Champignons de France, No. 442.
Hard, Mushrooms, Fig. 104, p. 139, 1908.

"Pileus 1-3 cm. broad, pliant, convex then expanded and *umbilicate,* fulvous-bay color or rufescent, *plicate-striate,* pallid alutaceus when dry, margin incurved. FLESH submembranaceus. GILLS adnexed, joined in a collar behind, distant, rufescent or yellowish, somewhat subdecurrent. STEM 2-3 cm. long, 1-2 mm. thick, tubular, chestnut-brown or paler, *velvety-pruinose,* inserted by the floccose base on wood. ODOR *very disagreeable,* but not of garlic similar to *M. performs.*" Spores 7-8x3.5-4 micr. (Pennington).

I have not seen this species within the borders of the state, but do not doubt that it occurs. It is not *Heliomyces foetans* Pat., as some think. It occurs on wood, fallen branches, etc. The description is adapted from Ricken.

44. Marasmius olneyi B. & C.

Ann. & Mag. N. H., 1859.

PILEUS 1-1.5 cm. broad, pliant, convex, soon expanded-plane and depressed, glabrous, *rufescent,* striate when moist, at length radiately rugose, dull luster. FLESH membranous, concolor. GILLS *attached to a collar which secedes from stem,* subdistant, narrow, *white,* arid, edge somewhat crenulate. STEM 2-4 cm. long, 1 mm. thick, dilated at apex, tubular, even, *white to pallid,* minutely pubescent-floccose, *attenuated downward* and inserted at base. SPORES narrowly elliptic-lanceolate, pointed at one end, 9-11x4-5 micr., smooth, white. ODOR none.

On fallen leaves and twigs, in frondose woods of beech, maple, etc. New Richmond. September.

This and *M. leptopus* Pk. seem closely related, the latter differing.

according to the description, by its glabrous stem and the spores which measure 7-9x3-4 micr.

45. Marasmius caricicola Kauff.

N. A. F., Vol. IX, p. 277, 1915.

PILEUS 4-8 mm. broad, *convex-expanded, obtuse,* radiately and broadly sulcate or alveolate, *pure white,* toughish, pliant, reviving, *pruinose.* FLESH very thin, membranaceus. GILLS adnate, thick, *very distant,* rather broad, pure white. STEM *very short,* about 2 mm. long, 0-7 mm. thick, terete, equal, central, subglabrous, *pure white,* horizontal or ascending, *inserted by a naked base.* SPORES elliptical-ovate, narrowed toward apiculus, obtusely rounded at opposite end, 15-18x6-6.5 micr. when mature, smooth, white. BASIDIA 2 or 4-spored, about 45x7 micr., elongated-clavate. STERIGMATA stout, awl-shaped, 7-8 micr. long. ODOR none.

Gregarious, on lower portion of Carex stems, in marshes, willow swamps, etc. Ann Arbor. October-November. Common locally.

Differs from *M. candidus* Fr. in the sense of all authors, in that the pileus is not umbilicate nor hemispherical, in its naked, inserted base of the stem, and probably in the spores. Quelet (Jura et. Vosges) gives the spores of the same length for *M. candidus.* Cooke (Ill.) gives minute spores, and Patouillard (Tab. Analyt.) figures them fusiform for *M. candidus.* Hard's photograph (Mushrooms, Fig. 107, p. 142, 1908) can scarcely be considered as the *M. candidus* of Fries, whose plant is described as minute, but is apparently *M. magnisporus* Murr. Manifestly, *M. candidus* Fr. is not well understood.

The trama of the pileus is composed of compact long, thickish, hyaline hyphae, differentiated at the surface into globose, hyaline cells 6-7 micr. in diameter.

SUBGENUS MYCENA: Margin of pileus at first straight and appressed. Stem *horny,* tubular, sometimes stuffed, tough and dry. Pileus submembranaceus.

Section IV. Chordales. Stem radicating or attached by floccose-radiating hairs.

46. Marasmius cohoerens Fr.—Bres.

Epicrisis, 1836-38 (as Mycena).

Illustrations: Fries, Icones, Pl. 80, Fig. 1 (as *Mycena cohoerens*).
Ricken, Blätterpilze, Pl. 25, Fig. 4.
Atkinson, Mushrooms, Fig. 127, p. 133, 1900.
Hard, Mushrooms, Fig. 106, p. 141.

PILEUS 1-2.5 cm. broad, campanulate-expanded, obtuse, sometimes umbonate, even, or striatulate when moist, *soft-velvety,* vinaceus-cinnamon to chestnut color, fading to alutaceus, margin at length repand-wavy. FLESH thin, concolor. GILLS adnate, rounded behind or sinuate, seceding, moderately broad, ventricose, close to subdistant, pallid at first, soon colored, brown, brick red to reddish-brown from the dark-colored, spiculate cystidia, sometimes intervenose. STEM 5-15 cm. long, 4-6 mm. thick, elongated, subequal, *horny, tubular,* even, glabrous and shining, sometimes obscurely velvety from spicules, *bay-brown to chestnut,* pallid at dilated apex, base darker and densely floccose with interwoven hairs which join the stems and attach them to substratum. SPORES variable in size, 6-8.5x4-5 micr., oval-elliptical, smooth, white. CYSTIDIA numerous over entire surface of gills, *lanceolate-aciculate,* 65-95x8-10 micr., *reddish-brown.* ODOR "somewhat disagreeable." (Ricken.)

Caespitose and coherent, on the ground or much decayed wood, in frondose woods. Throughout the state. July-September. Not infrequent.

The rigid, horny, dark stems, joined at base by a mass of white mycelial threads, the numerous cystidia and the size, distinguish this well-marked plant. Sometimes they grow singly. *Collybia lachnophylla* Berk and *Collybia spinulifera* Pk. have been shown by Atkinson to be identical with it. It is often referred to as *Mycena cohoerens.* The surface of the pileus and of the stem are usually covered by dark spicules like those of the gills, and the color of any of these parts varies in proportion to their abundance. These spicules are microscopic in size.

47. Marasmius elongatipes Pk.

N. Y. State Mus. Rep. 26, 1874 (as *M. longipes* Pk.).

"PILEUS 8-12 mm. broad, convex, glabrous, finely striate on the

margin, *tawny-red.* FLESH membranaceus. GILLS adnate, close, white. STEM 5-12 cm. long, filiform, *tall, straight,* equal hollow, *pruinose-tomentose,* radicating, brown or fawn color, apex white." SPORES 7-8x3.5 micr. (Pennington.) Among fallen leaves in woods. Rare.

It has been suggested that this is identical with *M. chordalis* (Fr.) Bres. I will, therefore, append Bresadola's description of that species:

"Pileus 1-2.5 cm. broad, convex, soon umbilicate, then expanded, dry, *umber, then livid-whitish, marked with reddish spots,* pruinose under a lens, with an incurved, at first striate then sulcate margin. FLESH membranaceus. GILLS adnate to subdecurrent, distant, whitish, *at length straw yellow and reddish spotted.* STEM 7-10 (rarely 15) cm. long, 1-2 mm. thick, straight, stuffed by a pith, (then hollow), *date-brown,* apex whitish, densely gray pruinose, in wet weather the surface is shiny from yellowish watery drops. SPORES fusoid-ventricose, 8-10x6 micr., hyaline under microscope. CYSTIDIA fusoid. BASIDIA clavate, 40x4-6 micr. ODOR none."

It is evident that here are two forms of Marasmius, clearly distinguishable by the colors. Specimens have been sent from Europe, according to Pennington (information by letter) marked *M. chordalis,* which had the color of our *M. elongatipes.* It seems probable that there are two species in Europe which are confused under the one name. Bresadola's figure does not illustrate our plants and Peck's name should be retained. It was originally called *M. longipes,* a name which had been pre-empted.

48. Marasmius papillatus Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 5-15 mm. broad, convex-expanded, *markedly papillate,* striatulate on margin, *dingy whitish with pink tinge,* opaque, slightly subtomentose or glabrous. FLESH submembranaceus. GILLS broadest behind, decurrent by tooth, narrow in front, close to subdistant, whitish or tinged yellowish. STEM 2-5 cm. long, 1 mm. thick, equal, elastic, toughish, hollow, *pruinose,* pallid, tinged flesh color, slightly darker below, *distinctly rooting.* SPORES 10-11 x3-4 micr., subcylindrical, smooth, white. CYSTIDIA few, scattered, narrowly lanceolate, about 50x5-6 micr., acuminate.

Gregarious, on decayed, mossy logs in coniferous regions. Bay View, New Richmond. July-September. Infrequent.

Easily known by its habitat, the small rounded umbo on the cap and the incarnate tinge of cap and stem.

49. Marasmius siccus (Schw.) Fr.

Synop. Fung. Car., 1822 (as *Mycena siccus*).
N. Y. State Mus. Rep. 23, 1870 (as *M. campanulatus* Pk.).
N. Y. State Mus. Bull. 105, 1906.

Illustration: Hard, Mushrooms, Pl. 17, Fig. 110, p. 146, 1908.

PILEUS 1-2.5 cm. broad, or sometimes smaller, at first subconical, broadly campanulate, at length often depressed in center, dry, glabrous, *distantly radiately striate-sulcate to the disk,* ochraceus-reddish to bright rose-madder, darker on disk, in age sometimes ferruginous. FLESH membranaceus. GILLS free or slightly attached, *narrowed toward stem,* broad in front, *distant,* white or tinged by color of pileus, subvenose. STEM 4-8 cm. long, slender, horny, *glabrous and shining,* blackish-brown, often pallid to white at apex, tubular, attached to leaves, etc., by small mycelioid base. SPORES elongated oblong-lanceolate, narrowed to the pointed apiculus, variable in size, 13-18 (up to 24) x3-4.5 micr., smooth, white. ODOR mild.

Gregarious, on fallen leaves, twigs and debris in frondose woods. Throughout the State. July-September. Frequent.

One of our most beautiful species of Marasmius, due to its bright colors when in full luxuriance. The color varies considerably and in age is often rusty-reddish on the cap. The stem is paler at times when young. The spores are very variable, and either continue to mature, or in wet weather become elongated by the first stages of germination. Peck referred it to the species of Schweinitz, whose specimens of *M. siccus* are preserved in the herbarium of the Philadelphia Academy of Science. This species has been reported by De Seynes as occurring in the region of the Congo in Africa.

50. Marasmius felix Morg.

Jour. Mycol., Vol. 12, 1906.

PILEUS 3-8 mm. broad, convex-plane, dry, glabrous, striate-rugulose when dry, *rufescent.* FLESH membranaceus. GILLS adnate, not broad, *distant,* white, venose, sometimes forked. STEM 2-8 cm. long, filiform, brownish to blackish-brown, sometimes whit-

ish at apex, minutely brown-pubescent or velvety, instititious, slightly brown-hairy at insertion, base attached to veins of fallen oak leaves. SPORES elliptical, 7-9x4-5 micr., smooth, white.

In frondose woods. Ann Arbor.

Section V. Rotulae. Stem instititious, filiform, horny or rigid-setaceous. (Attached to leaves, twigs, etc.)

51. Marasmius rotula Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1129.
Gillet, Champignons de France, No. 443.
Berkeley, Outlines, Pl. 14, Fig. 7.
Ricken, Blätterpilze, Pl. 25, Fig. 10.
Hard, Mushrooms, Fig. 108, p. 143.
Conn. State Geol. & Nat. Hist. Surv., Bull. 15, Pl. 5.

PILEUS 4-10 mm. broad (rarely broader), pliant, hemispherical-convex, subumbonate-*umbilicate, white* or whitish, umbilicus darker, *radiately plicate,* glabrous, margin crenate. FLESH membranaceus. GILLS *attached to a free collar behind,* distant, broad, whitish-pallid. Stem 2-5 cm. long, filiform, horny, tubular, black or brownish-black, whitish at apex, entirely naked, instititious. SPORES lanceolate-fusiform, 6-9x3-4 micr., smooth, white. ODOR none.

On fallen twigs, leaves and around base of living trunks, gregarious. Throughout the State. May-September. Very common.

Often in great abundance after rains in woods, around shade trees, thickets, etc., and is our commonest Marasmius. Its beautifully pleated white cap and black stem cause it to be a striking little plant when moist and fully expanded. Sometimes the plants arise in series along a prostrate black strand, and are then often sterile.

52. Marasmius graminum Libert.

Plant. Crypt., 1837.

Illustrations: Cooke, Ill., Pl. 1129.
Berkeley, Outlines, Pl. 14, Fig. 8.
Gillet, Champignons de France, No. 443.
Ricken, Blätterpilze, Pl. 25, Fig. 9.
Patouillard, Tab. Analyt., No. 325.

"PILEUS *minute,* 2-4 mm. broad, nearly plane, umbonate, *pale rufous, sulcate,* the furrows paler, umbo brown. GILLS few, subventricose, cream-colored, intervenose, *attached to a free collar.* STEM 2-4 cm. long, capillary, shining-black, apex white, entirely naked." SPORES obovate, 5-6 micr. long (Sacc.); lanceolate, 12-15 x3-4 micr. (Ricken) (Schroeter); globose, 3-4 micr. diam. (Massee) (Cooke).

Gregarious, attached to grass-leaves. Southern Michigan.

The description is adapted from Berkeley. Ricken and Schroeter describe it somewhat differently: "PILEUS bright reddish-yellow or brownish-orange, depressed and darker in center. GILLS very distant, all the same length, white or whitish. STEM entirely brownish-black or whitish at apex, hair-like in form, tough and hard." (Otherwise as above, but with long spores.) The very different sizes reported for the spores, show it to be as yet an uncertainly understood species. I have no record of the spores.

53. Marasmius androsaceus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1129.
Gillet, Champignons de France, No. 439.
Ricken, Blätterpilze, Pl. 25, Fig. 6.
Hard, Mushrooms, Fig. 103, p. 138, 1908.

PILEUS 6-12 mm. broad, at first subhemispherical, soon expanded and depressed-umbilicate, *reddish-brown or with purplish-tint,* sometimes whitish, distantly sulcate-striate or radiately wrinkled, glabrous. FLESH membranaceus. GILLS *adnate,* thickish, *distant,* moderately broad, sometimes forked, flesh-color or rufescent. STEM 3-6 cm. long, *capillary, tubular,* tough and hard, glabrous-shining, *black,* apex paler, equal or dilated at apex, insti-

titious. SPORES lanceolate, 6-8x2.5-3 micr., smooth, white. ODOR *none.*

Gregarious, attached to fallen leaves, twigs, pine needles, etc. Houghton, New Richmond and probably throughout the state. July-September.

Not to be confused with *M. perforans* Fr. which has a similar appearance, but differs in possessing a strong, specific odor (not of garlic), and in its minutely-velvety stem covering.

54. Marasmius epiphyllus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1137.
Patouillard, Tab. Analyt., No. 219.

PILEUS 2-8 mm. broad, convex, at length flattened and depressed or subumbilicate, subpruinose or glabrous, *milk-white* rugulose. FLESH membranaceus. GILLS adnate, few, *very distant,* white. STEM 1-4 cm. long, filiform, equal, *reddish-brown,* paler or whitish at apex, *pruinose, pubescent* toward base, instititious, tough. SPORES narrowly fusiform-lanceolate, 9-12x3-4 micr., smooth, white. CYSTIDIA moderately abundant, on sides and edge of gills, 40-50x7-8 micr., subacuminate, narrowly lanceolate. BASIDIA 30x7 micr., 4-spored. ODOR none.

Gregarious, on fallen leaves of oak, etc., attached to midrib and veins. Ann Arbor. October.

Distinguished from the preceding by the pruinose stem. *M. instititious* Fr. is said to differ by the sulcate-plicate pileus and the thicker stem which tapers downward. The spore-sizes given by various authors clash here as in many other cases. Massee and Cooke give them as 3x2 micr.; Morgan (ex Saccardo) as 6-7x2. Our plants appear to be those of Ricken.

55. Marasmius capillaris Morg.

Ann. Soc. of Nat. Hist. Jour., Vol. 6, 1883.

PILEUS 2-6 mm. broad, convex, umbilicate, plicate-sulcate, alutaceus sometimes darker, *with white umbilicus,* glabrous. FLESH membranaceus. GILLS *adnate to a free collar,* moderately broad, white, distant. STEM 3-5 cm. long, capillary, equal, long, black, scarcely whitish at very apex, glabrous-shining, tubular, tough,

instititious. SPORES oblong-lanceolate, 8-10x4-5 micr., smooth, white. ODOR none.

Gregarious on fallen leaves of oak, etc., twigs and sticks in woods. Ann Arbor. September.

Known by its long, filiform black stem and the white umbilicus which is in marked contrast to the color of the rest of pileus.

Heliomyces Lev.

(From the Greek, *helios,* the sun, and *myphes,* a fungus.)

Flesh tremelloid, subcoreaceous, reviving in moist weather. Pileus rugose, sulcate or reticulate-ridged. Stem central, confluent with the pileus, tough. No veil. Gills with acute edge.

Marasmius-like plants with a gelatinous trama, usually lignicolous. The species are few and have been poorly studied; probably most of them occur in the tropical regions. It is highly desirable to know the microscopic structure of the species so far referred here. *Pleurotus subpalmatus* is closely related to this genus, and should perhaps be included. Only two species are represented in my collections.

56. Heliomyces nigripes (Schw.) Morg.

Epicrisis, 1836-38.

Illustrations: Hard, Mushrooms, Fig. 115, p. 152, 1908.
Lloyd, Myc. Notes, No. 5, Fig. 19 and 20, p. 46.

PILEUS 1-2 cm. broad, very thin, *pure chalk-white,* convex then expanded, pruinose, rugulose-subsulcate; *trama* composed of *subgelatinous hyphae* much interwoven. GILLS adnate or adnato-decurrent, subdistant, unequal, intervenose, some forked, *white,* rufescent. STEM 2-4 cm. long, 1-2 mm. thick, enlarged and usually compressed above, tapering downward, *instititious,* cartilaginous-tough, *black,* white-pruinose at first, minutely tubular, black within. SPORES coarsely stellate, 3-5 rayed, hyaline, 8-9 micr. diam. CYSTIDIA none.

On sticks, stems of Equisetum, fallen leaves, etc., in mixed woods. New Richmond. September.

In age the colors of the whole plant change to alutaceous. This species has usually been referred to Marasmius. It is an American plant and was placed in that genus by de Schweinitz. In his North

American Species of Marasmius (Jour. Mycol., Vol. 12, p. 98), Morgan included it under Heliomyces, where it probably belongs, although the gelatinous character of the trama is not very strongly developed. Its peculiar spores set it off from all others; Lloyd has given us a photograph showing their stellate character.

57. Heliomyces pruinosipes Pk. var.

N. Y. State Mus. Bull. 167, 1913.

PILEUS 1-2 cm. broad, *tremelloid,* convex then plane, minutely pubescent, hygrophanous, dark chestnut-brown, becoming paler, *surface marked by convolute, crowded, obtuse ridges,* not viscid. FLESH thick, becoming tough and slightly horny when dry, reddish-pallid. GILLS adnate running down the stem by short lines, medium broad, close, thin, pallid to dingy ochraceous, becoming brownish-yellow on drying, edge entire. STEM 3-4.5 cm. long. 3 mm. thick, equal, hollow, compressed, somewhat twisted and canaliculate on drying, fibrous, tough, *dark chestnut brown,* fading, clothed by a short tomentose pubescense. SPORES minute, oblong, 5x2.5 micr., smooth, white. TRAMA of cap of large, gelatinous, interwoven hyphae, which in cross-section have a very refractive center; that of gills of similar but more slender hyphae. ODOR and TASTE mild.

The specimen was sent by Mrs. Cahn, from Detroit, in July. The description applies only to our plant. It departs from the description of Peck in that the cap does not at first possess the bright orange-red colors and although our specimens were rather fresh such a loss of color by fading might be expected. A more important difference is the distinct cerebrose surface of the pileus in our plant, not mentioned at all by Peck; for the present it may be considered var. *cerebrosus,* until further data are at hand. It is evidently rare, but there is a curious coincidence in its discovery in the same year at three separate localities, viz., Vaughns and Ithaca, N. Y., and Detroit, Michigan.

LACTARIEÆ

Context of fruit-body fleshy, putrescent, *vesiculose;* stem confluent with pileus and gills, central; gills brittle, attached, acute on edge, mostly with cystidia in the hymenium; spores sphoeroid, rough, white, yellowish or ochraceous.

This subfamily is sharply set off from the others by the vesiculose trama of the fruit-body and the echinulate or otherwise roughened, globose spores. With the exception of the Cortinarii, no other groups develop such a variety of bright-colored pilei. Many of them possess a strong acrid taste, and nearly all of them have specially differentiated hyphae scattered through the trama, which in the Lactarii secrete a milky or colored juice. The hymenium is composed of cylindric-clavate basidia intermingled with cystidia; the latter often extend into or below the subhymenium, and in the young plant project above the basidia; later they are often even with the rest of the hymenium. In a few cases the cystidia are scanty or lacking. The subhymenium is differentiated to a greater or less extent in the different species, consisting of a tissue of small roundish cells between basidia and trama.

The group is apparently derived from Hygrophorus, probably by several paths. The gills have a somewhat waxy consistency in some species, reminding one of the gills of that genus. There are two well-marked genera:

Lactarius, exuding a milky juice when wounded.

Russula, without this juice.

Lactarius Fr.

(From the Latin, *lac,* milk.)

Veil none; the trama composed of *vesiculose* tissue, and *with a milky or colored juice* which exudes when plant is broken; gills rigid, fragile, acute on edge; stem central, confluent with the pileus; spores globose or subglobose, usually echinulate or verrucose, white or yellowish.

Fleshy and putrescent fungi, often of large size, mostly terrestrial, sometimes on much decayed wood. The genus is very distinct and

most closely related to Russula, from which it differs by the exudation of a milky or colored juice from the gills and elsewhere when wounded. The abundance and size of many species which are *edible* makes this an important genus economically; but a number of species are believed to be *poisonous* and must be carefully distinguished.

The PILEUS may be white, yellow, orange, green, blue, reddish, tan, gray, etc., often with the colors in variegated zones of related hues. It is either dry or viscid, glabrous, velvety or tomentose, and the margin which is at first involute is usually much more velvety or tomentose than the center of the pileus; in some species, however, the margin is naked. The GILLS are usually adnate at first or acuminate on the stem, becoming spuriously decurrent in many cases as the margin of the pileus is elevated at maturity or in age. They are usually rigid-brittle, and exude the milky juice to best advantage when quickly cut by a sharp-pointed instrument. They are usually of unequal length and often forked, sometimes dichotomously as in *L. piperatus*. The color of the gills varies from white to yellowish or grayish, and in many cases they become distinctly darker in age, a character on which the main division has been based. In one group they become dusted by the spores and are said to be pruinose in age. The STEM has a rigid cortex with a spongy-stuffed interior, and becomes rather brittle. It is never fibrous but may become hollow or cavernous with age. It is either white or has the color of the pileus, but often diluted. Its rigid, stiff-looking appearance, which is due to the vesiculose structure of the flesh, gives both the species of this genus as well as those of Russula a characteristic pose by which these two genera are soon easily recognized. The TRAMA has a structure which, along with that of the Russulas, is unique among the Agaricaceae. The hyphae of the usual slender, filamentous type of other genera are rather scanty, and interweave among clusters of thin-walled, parenchyma-like, isodiametric cells, forming the so-called vesiculose tissue. Mixed with the filamentous are the milk-bearing hyphae, called "latex-tubes" or "lactiferes." These extend longtitudinally up through the stem, spread out in the pileus and extend through the gills. The "MILK," as it is called, is usually white as it comes from a sudden wound, but in several species it is colored blue, orange or red. After the white milk is exposed to the air for a few minutes, it either remains unchanged or becomes yellow, lilac, pink, greenish or grayish. In many species this change is only noticeable where the milk touches the flesh, and the latter takes on the corresponding

color. In a few species the juice is watery or a diluted white; this was considered by Fries as a degenerate condition due to the habitat. During very dry weather or in old specimens the juice is dried up and does not respond to the wounding of the tissue. Some species of Mycena are also supplied with a colored juice, but these lack the vesiculose trama and are very slender-stemmed plants. The TASTE of the milk and flesh is often very acrid in fresh plants and continued sampling of many specimens the same day is apt to produce a sore tongue. It is, however, necessary to know whether a species is acrid or mild, hence cautious tasting of minute pieces of the gills is not objectionable and if kept in the mouth but a short time and not swallowed, no harm results. This character is of great importance in determining the species of this genus. Some species, usually called mild, have a woody or bitterish taste. The SPORES are globose to almost broadly elliptical in some species. The epispore is decorated with minute spines, reticulations, etc. The color varies from white to yellowish, not nearly as variable as in the genus Russula. The size of the spore is not sufficiently different to be of much use in ordinary diagnosis of species. CYSTIDIA are abundant in many of the species, and are apparently of the same nature as in Russula.

Many species, especially those with a mild taste, are EDIBLE, and are much prized by mycophagists; such are *L. deliciosus, L. volemus, L. hygrophoroides, L. indigo,* etc. The very acrid species should be tried cautiously. Some are considered poisonous and have been so marked. The poison is, however, not of the same order as in the Amanitas, and there is a growing belief that if properly prepared most, if not all of them, may be eaten with impunity. *L. piperatus,* whose milk has a most excruciatingly biting effect on the tongue when taken from a fresh plant, is known to be perfectly safe after it is cooked. All serious accidents which have come to my notice in the state, have been traced with fair certainty to the Amanitas. Any mushroom, however, especially if fried, may cause illness to people with poor digestion in the same way as many other delicious articles of food.

The Lactarii are most abundant during July and August, with a similar seasonal range as the Russulas. They often occur in large numbers in the open woods of higher ground, although some species are mostly limited to swamps, bogs and low rich woods. I have seen hundreds of individuals of several species, including *L. vellereus,* in an area several rods in extent. Others like *L. indigo* are mostly few in a place and occur in widely separated localities.

The Friesian arrangement into two main groups is here retained. Other groupings which have been attempted, seem to me to have brought out no clearer relationships and tend only to complicate matters. The main divisions are here considered as subgenera. These have been subdivided into sections, depending on the character of the surface of the pileus, and on the taste. The key includes only the species so far identified from plants gathered within the state.

Key to the Species

(A) Milk brightly colored from the first. [See also (AA) and (AAA)].
(a) Young gills and milk indigo-blue. 78. *L. indigo* Schw.
(aa) Not indigo-blue.
(b) Young gills and milk dark red. 76. *L. subpurpureus* Pk.
(bb) Young gills and milk orange. 77. *L. deliciosus* Fr.
(AA) Milk at first white, changing color on exposure to the air, at least on the flesh.
(a) Milk becoming lilac or violet-lilac, at least on the bruised flesh.
(b) Pileus zonate, 8-12 cm. broad; stem spotted. 75. *L. maculatus* Pk.
(bb) Pileus azonate, 3-7 cm. broad; stem not spotted. 74. *L. uvidus* Fr.
(aa) Milk not changing to lilac.
(b) Milk becoming pinkish-red, at least on the bruised flesh.
(c) Pileus chocolate-brown to pale sooty-brown, usually rugose. 80. *L. lignyotus* Fr.
(cc) Pileus grayish-brown to isabelline, even. 79. *L. fulginosus* Fr.
(bb) Milk not changing to pinkish red.
(c) Milk becoming yellow, at least on the bruised flesh.
(d) Margin of pileus tomentose-hairy.
(e) Stem spotted; pileus straw-color to ochraceous. 60. *L. scrobiculatus* Fr.
(ee) Stem not spotted; pileus buff tinged with flesh color. 62. *L. cilicioides* Fr.
(dd) Margin of pileus glabrous or nearly so.
(e) Pileus azonate, dry or scarcely viscid, some shade of reddish-brown.
(f) Odor strong, disagreeable. 69. *L. theiogalus* Fr.
(ff) Not with marked odor.
(g) Pileus substriate on margin, fading to isabelline. 88. *L. isabellinus* Burl.
(gg) Pileus even on margin, color of *L. comphoratus*. 87. *L. colorascens* Pk.
(ee) Pileus zonate, at least toward margin.
(f) Pileus very viscid when moist, orange-yellow. 86. *L. croceus* Burl.
(ff) Pileus subviscid.
(g) Pileus distinctly spotted-zoned with dull-orange zones; milk very acrid. 68. *L. chrysorheus* Fr.
(gg) Pileus faintly zonate; milk tardily acrid or bitterish. 69. *L. theiogalus* Fr.
(cc) Milk not changing to yellow.
(d) Milk becoming greenish on the bruised flesh.
(e) Pileus dark olive-green, rather rigid, zonate. 59. *L. atrovirides* Pk.
(ee) Pileus livid-smoky-gray, azonate. 73. *L. trivialis* var. *viridilactis*.
(dd) Milk not changing to green or brownish on flesh.
(e) Gills stained gray where bruised.

(f) Pileus olive-brown to umber, rigid, 6-12 cm. broad. 58. *L. turpis* Fr.
(ff) Pileus drab-colored to lilac-grayish, 3-6 cm. broad. 85. *L. vietus* Fr.
(ee) Milk changing to brown on the flesh. 94. *L. luteolus* Pk.

(AAA) Milk white, unchanging.
(a) Pileus viscid when moist.
(b) Margin of pileus distinctly tomentose-hairy; pileus incarnate-tinged. 61. *L. torminosus* Fr.
(bb) Margin of pileus glabrous or nearly so.
(c) Pileus distinctly zonate, more or less copper-orange color. 70. *L. insulsus* Fr.
(cc) Pileus not or obscurely zonate.
(d) Pileus large, usually 8-15 cm. broad.
(e) Pileus pale yellowish or subochraceous; gills broad. 71. *L. affinis* Pk.
(ee) Pileus white soon spotted-stained; gills becoming flesh-colored. 65. *L. controversus* Fr.
(eee) Pileus livid-smoky gray or tinged slightly with lilac-purplish. 73. *L. trivialis* Fr.
(dd) Pileus medium to small, less than 8 cm. broad.
(e) Pileus drab or lilac-gray; gills pruinose. 85. *L. vietus* Fr.
(ee) Pileus some other color.
(f) Pileus and stem cinereus, glabrous, small. 84. *L. cinereus* Pk.
(ff) Pileus reddish.
(g) Pileus unbonate-papillate, reddish-fulvous, 1-2 cm. broad. 96. *L. oculatus* (Pk.) Burl.
(gg) Pileus umbilicate-depressed, reddish-brown, 5-7 cm. broad. 72. *L. hysginus* Fr.
(aa) Pileus not viscid.
(b) Pileus minutely tomentose, scaly, pubescent or with velvety-bloom.
(c) Taste mild, never acrid; pileus reddish-brown to pale tawny.
(d) Gills close; pileus rugose-reticulate, velvety-pubescent. 92. *L. corrugis* Pk.
(dd) Gills distant; pileus even or slightly rugulose, almost glabrous. 93. *L. hygrophoroides* B. & C.
(cc) Taste acrid or slowly acrid, if mild then pileus not reddish-brown.
(d) Odor aromatic, rather strong.
(e) Pileus ashy to smoky-brown. *L. glyciosmus* Fr.
(ee) Pileus tawny to isabelline; in swamps and bogs. 81. *L. helvus* Fr.
(dd) Odor none.
(e) Pileus white or whitish.
(f) Pileus persistently velvety-tomentose on entire surface. 63. *L. vellereus* Fr.
(ff) Pileus glabrous on center, margin densely cottony-tomentose. 64. *L. deceptivus* Fr.
(ee) Pileus not white.
(f) Pileus 1-3 cm. broad, gray; often on much decayed wood. 83. *L. griseus* Pk.
(ff) Pileus 2-7 cm. broad; flesh reddish or flesh-color where bruised.
(g) Pileus chocolate-brown to pale sooty-brown, rugose on center. 80. *L. lignyotus* Fr.
(gg) Pileus grayish-brown to isabelline. 79. *L. fuliginosus* Fr.
(bb) Pileus glabrous.
(c) Pileus etc. white; gills very crowded, dichotomously forked.

66. *L. piperatus* Fr.
(cc) Pileus not white.
(d) Pileus some shade of gray or brown.
(e) Gills becoming dingy greenish-brown where bruised.
(f) Pileus 1-3 cm. broad, pale lilaceous-umber. 89. *L. parvus* Pk.
(ff) Pileus 3-6 cm. broad, grayish-buff. 90. *L. varius* Pk.
(ee) Gills not changing to greenish-brown when wounded; pileus zoned, gray to brownish-gray. 67. *L. pyrogalus* Fr.
(dd) Pileus some shade of red or yellow.
(e) Gills distant; pileus pale brownish-orange. 93. *L. hygrophoroides* B. & C.
(ee) Gills close or subdistant.
(f) Taste acrid.
(g) Pileus bay-red to rufus. 82. *L. rufus* Fr.
(gg) Pileus pale, yellowish to subochraceus. 71. *L. affinis* Pk.
(ff) Taste mild or nearly so.
(g) Odor aromatic, sometimes faint.
(h) Pileus even, brown-red; color persisting. 97. *L. camphoratus* Fr.
(hh) Pileus rimulose, areolate, brown-red, fading. 98. *L. rimosellus* Pk.
(gg) Odor none.
(h) Pileus 5-12 cm. broad, brownish-orange to fulvous; stem solid. 91. *L. volemus* Fr.
(hh) Pileus 2-5 cm. broad, brownish-red to isabelline; stem stuffed to hollow. 95. *L. subdulcis* Fr.

PIPERITES: Gills not becoming darker nor pruinose-sprinkled in age.

In this group the milk is either colored or white. In some species it changes on exposure to the air and stains the gills so that they assume a different color than at first; such species must not be referred to the second group, since there the gills assume a darker color without reference to the milk.

Section I. Pileus, especially on margin, shaggy, scabrous, tomentose or hairy-fringed; taste *acrid.*

58. Lactarius turpis Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Sverig. Svamp., Pl. 60.
Cooke, Ill., Pl. 987.
Gillet, Champignons de France, No. 397.
Ricken, Blätterpilze, Pl. 9, Fig. 4.

PILEUS 6-12 cm. broad, *rigid,* convex-umbilicate, then expanded and depressed, *olive-brown to umber,* darker on disk, azonate, some-

what roughish-floccose, *fibrils glutinous when moist,* at length subglabrous, margin at first involute with an olivaceus-yellow villosity. FLESH whitish, compact, thick. GILLS adnate, decurrent, narrow, close to crowded, dingy cream-colored, *stained gray or nearly black where bruised.* STEM 3-4 cm. long, 1.5-2.5 cm. thick, stout, short, firm, scarcely viscid, glabrous, concolor or paler than pileus, *often spotted with darker spots,* even, stuffed, sometimes hollow. SPORES "globose, echinulate, 6.5-8 micr." (Burl.) MILK white, unchanging, causing gray stains on gills, *acrid.* ODOR slight. *Edible.*

Gregarious or solitary. On the ground in the north, in mixed woods of hemlock, balsam, poplar, maple, etc. Presque Isle, Marquette. August-September. Rare or frequent locally.

It is very distinct from *L. atroviridis* in its colors and in the character of the surface of the pileus, etc. Dried specimens are grayish-black. *Lactarius sordidus* Pk. is without doubt the same. It is said to be eaten in Europe, although as Fries remarks, it has a loathsome appearance. It has somewhat the habit of *Paxillus involutus* and like the latter, prefers coniferous woods.

59. Lactarius atroviridis Pk.

N. Y. State Mus. Rep. 42, 1889.

Illustration: Hard, Mushrooms, Fig. 139, p. 175, 1908 (not typical).

PILEUS 6-15 cm. broad, *subrigid,* convex-expanded, soon depressed, *dry,* rough-scabrous to scabrous-hairy, often rugose, *dark olive-green,* becoming blackish-green, sometimes obscurely mottled-zonate toward margin, which is at first involute then spreading and thin. FLESH whitish, thick and compact on disk. GILLS adnate or subdecurrent, close, distinct, rather narrow, whitish at first, *stained with dark green where bruised* or in age, intervenose, few forked. STEM *short,* 2-5 cm. long, 1-2.5 cm. thick, stout, subrigid, equal, dry, glabrous, *dark-greenish,* soon hollow or cavernous. SPORES "subglobose, echinulate, 7-8 micr., white." (Burl.) MILK white, unchanging, causing dark green stains on gills, *acrid.*

Gregarious. On the ground in frondose woods. Ann Arbor, Detroit. August. Infrequent.

Blackish when dried. A very curious and repellent mushroom, concerning whose edibility nothing is known. It is quite distinct and easily recognized by its blackish-green colors, rigid flesh and

short stem. The pileus is relatively much broader than the stem and is often exceedingly rough-scabrous on the surface, especially in dry weather. It seems distributed over the northeastern portion of the United States, but is not often collected. The stem is often spotted with darker spots.

60. Lactarius scrobiculatus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 971.
Gillet, Champignons de France, No. 392.
Patouillard, Tab. Analyt., No. 409.
Michael, Führer f. Pilzfreunde, Vol. II, No. 53.
Hard, Mushrooms, Fig. 133, p. 169, 1908.
Ricken, Blätterpilze, Pl. 9, Fig. 2.

PILEUS 7-17 cm. broad, convex-depressed, at length infundibuliform, varying azonate to markedly zonate, *viscid when moist,* often covered by a thin, hairy tomentum, *straw-yellow to dark ochraceus,* becoming subferruginous and areately cracked when dry, *margin* at first involute and *tomentose-hairy or densely fringed.* FLESH compact, firm, white, changing to yellowish from the milk. GILLS adnate, subdecurrent, narrow, crowded, sometimes forked or anastomosing on stem, whitish or yellowish, darker where wounded. STEM 3-6 cm. long, 2.5-3 mm. thick, *stout,* short, equal, stuffed then hollow, glabrous, concolor or paler than pileus, *with depressed, roundish spots of a brighter color.* SPORES subglobose-elliptical, "minutely echinulate, 6.5-7x8-10 micr., white." (Burl.) MILK white, *changing quickly to sulphur-yellow, acrid. Poisonous.*

Gregarious. On the ground in moist woods, or along mossy margins of swamps, mostly in coniferous regions. Bay View, Huron Mountains, New Richmond. July-August. Infrequent.

The well-marked depressed spots on the stem and the tomentose-hairy margin distinguish it. The margin finally becomes spreading or elevated and the tomentosity gradually disappears. The zones of the pileus may be very obscure or quite distinct; in one large specimen I counted seventeen zones. It is a magnificent mushroom when in full luxuriance, but is not often found.

61. Lactarius torminosus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 28.
Cooke, Ill., Pl. 972.
Gillet, Champignons de France, No. 395.
Michael, Führer f. Pilzfreunde, Vol. I, No. 38.
Hard, Mushrooms, Fig. 127, p. 165, 1908.
Atkinson, Mushrooms, Fig. 118, p. 119, 1900.
Ricken, Blätterpilze, Pl. 9, Fig. 3.

PILEUS 4-10 cm. broad, convex, depressed to subinfundibuliform, viscid when young or moist, ochraceus-buff *tinged with rosy-flesh color,* spotted-zoned, sometimes paler and azonate, *margin* at first involute and *persistently tomentose-hairy or fringed,* disk glabrous. FLESH rather soft, thick, white or tinged incarnate. GILLS decurrent, narrow, thin, close, some forked at base, whitish to creamy, *at length incarnate or reddish-yellow.* STEM 3-6 cm. long, 1.5-2 cm. thick, short, equal or tapering downwards, glabrous or pruinose, even, stuffed then hollow, flesh-color, paler below, sometimes spotted. SPORES "elliptical, echinulate, 8-10x6-8 micr., white." (Burl.) MILK white, *unchanging, very acrid. Poisonous.*

Gregarious. On the ground in mixed forests of birch and hemlock, etc., and in frondose woods of oak, maple, elm, etc.

Throughout the state, from the southern limits to Isle Royale. July-September. Frequent.

Known by the tomentose-fringed margin of the pileus, the zones on the surface, the white, acrid milk which remains unchanged, and the pinkish-yellow or ochraceus color. It must be carefully distinguished from the edible species like *L. deliciosus.* It is usually much paler than the latter, but occasionally approaches it in its colors, and *L. deliciosus* has colored milk and the margin of pileus is naked. *L. torminosus* is poisonous, yet the Russian peasants are said to preserve it and eat it seasoned with oil and vinegar.

62. Lactarius cilicioides Fr. (Poisonous)

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 973.

"PILEUS 4-10 cm. broad, broadly convex or nearly plane, umbili-

cate or centrally depressed, occasionally subinfundibuliform, *covered with long matted hairs or tomentum,* the center sometimes naked with age, *azonate,* viscid when moist, white, reddish, buff or dingy incarnate. FLESH soft. GILLS adnate or slightly decurrent, thin, rather narrow, close, some forked, white or tinged with yellow or incarnate. STEM 2-3 cm. long, 6-12 mm. thick, *short,* equal or tapering downward, pruinose, stuffed then hollow, *not spotted,* white or whitish. SPORES globose-elliptical, 6-8 micr., white. MILK white, sparse, slowly changing to pale yellow, *acrid.*

"In pine woods. September-October."

The description is adapted from Peck (N. Y. Mus. Rep. 38) who remarks that it is distinguished from all others by its conspicuously woolly pileus. The hairs or fibrils are long and intricately matted, and very viscid in wet weather. The milk is said to be very sparse, and in a white variety, sometimes wanting. I have not yet found it in the state, but as it is said to be *poisonous* like the preceding, to which it is closely related, it seemed desirable to include it. The white variety might be mistaken for a Russula.

63. Lactarius vellerius Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 980.
Bresadola, Fungh. Mang. e. Vel., Pl. 67.
Gillet, Champignons de France, No. 400.
Ricken, Blätterpilze, Pl. 10, Fig. 2.
Hussey, Illust. Brit. Myc. I, Pl. 63.
White, Conn. Geol. Nat. Hist. Surv., Bull. 15, Pl. 13.

PILEUS 6-12 cm. broad, subrigid, convex-umbilicate, at length expanded and concave-depressed, *dry, white or whitish, entirely minutely tomentose,* velvety to the touch, margin at first involute then spreading or elevated. FLESH compact, thick white or *stained* from the milk. GILLS adnate-subdecurrent, *subdistant to distant,* moderately broad, somewhat forked, whitish to creamy-yellow becoming brownish-stained. STEM 1.5 cm. long, 1.5-3 cm. thick, equal or tapering downward, *short, stout, pruinose-pubescent,* white, rigid, solid. SPORES subglobose to broadly elliptical, *nearly smooth,* 7-9 micr., white. MILK white, unchanging or temporarily cream-colored, sometimes lacking, *acrid. Poisonous.*

Gregarious. On the ground in mixed and frondose woods, often very abundant.

Throughout the state from the southern limits to Lake Superior. July-September. Rather frequent locally.

This differs from *L. piperatus* in the velvety-tomentose pileus and rather distant gills. *L. deceptivus* has a thick, cottony tomentum on the involute margin, but is almost glabrous elsewhere. Sometimes the milk of *L. vellerius* seems to be lacking, when it might be mistaken for *Russula delica;* the latter, however, lacks the tomentosity of the pileus as a rule, and often has a greenish tinge on the apex of the stem and the edge of the gills. Its edibilty is questioned, but McIlvaine ate it for years. Others also consider it edible since it loses its acridity when cooked. Without doubt it can be eaten by some, but like *Lepiota morgani,* causes bad effects in others. The nature of its harmful principle should be investigated.

64. Lactarius deceptivus Pk. (Edible)

N. Y. State Mus. Rep. 38, 1885.

Illustrations: Peck, N. Y. State Mus. Rep. 54, Pl. 70, Fig. 7-I, 1901.

White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 8, op. p. 30.

Hard, Mushrooms, Fig. 129, p. 167 (poor).

PILEUS 7-15 cm. broad, firm, convex-umbilicate, then expanded-depressed or subinfundibuliform, dry, glabrous or nearly so except the margin, *white or whitish,* often with dingy rusty stains, *margin* at first involute and *densely cottony-tomentose,* then spreading or elevated and fibrillose. FLESH compact, thick, white. GILLS adnate-subdecurrent, *rather broad,* subdistant, some forked, white or cream-yellow. STEM 3-7 cm. long, 1-4 cm. thick, stout, short, *solid,* equal or tapering downward, pruinose-pubescent, white. SPORES subglobose to broadly elliptical, 9-12 micr., echinulate, white. MILK white, unchanging, *acrid. Edible.*

Gregarious. On the ground, especially in coniferous woods, occasionally in frondose woods.

Isle Royale, Huron Mountains, Marquette, Houghton, Detroit; throughout the state. July-September. Sometimes very abundant in the north.

Easily confused with *L. vellerius,* from which it differs in the thick, cottony inrolled margin of the pileus and its glabrous surface elsewhere. It has also large spores as compared with *L. vellerius.* It has been eaten in quantity by Peck who pronounces it of fair quality, since the acrid taste disappears in cooking; with us it is far

more abundant in the Northern Peninsula, apparently prefering the colder latitude or altitude. It is said to be most abundant in the mountainous regions in the eastern United States.

65. Lactarius controversus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 29.
Bresadola, Fungh. mang. e. vel., Pl. 61.
Gillet, Champignons de France, No. 381.
Cooke, Ill., Pl. 1003 (extreme form).

PILEUS 8-20 cm. broad, firm, convex and broadly umbilicate or depressed, at length infundibuliform, *viscid* when moist, appressed subtomentose or flocculose, *white at first,* at length tinged incarnate and *stained with brownish flesh colored spots, obscurely* zoned toward margin which is at first involute but soon spreading and elevated or reflexed. FLESH white or at length slightly incarnate. GILLS attenuate behind, at length ascending-decurrent, abrupt, *narrow, crowded,* whitish at first *then strongly incarnate* to pink-incarnate, thin, rather easily separable from pileus. STEM 3-4 cm. long, 1-3 cm. thick, *often eccentric,* equal or narrowed downward, *solid,* firm or spongy, subflocculose, glabrescent, even, not spotted, white within and without. SPORES subglobose, echinulate, 5-7 micr., white or slightly incarnate-tinged. MILK white, unchanging, *slowly acrid,* often rather scanty.

Gregarious. On the ground in low, moist, frondose woods. Ann Arbor, Jackson, Detroit, etc. August-September. Frequent in the southeastern part of the state.

This interesting species I have seen frequently and it appeared to be undescribed. A comparison of figures and descriptions has convinced me that it is an American form of *L. controversus.* The spots on the cap do not become so deeply colored as described for the European plant, but otherwise there is very little discrepancy. When young the plants are white and are easily mistaken for *L. piperatus,* but soon the gills, etc., take on the characteristic flesh-color. The color of the gills is often bright incarnate while that of the cap, flesh and stem is slightly so only in age. The stem is sometimes somewhat proemorsely rooted. The European plant is said to be edible. A form occurs which has a hollow stem but otherwise not very distinct; this may be *L. pubescens* Fr. The latter is said to be much smaller.

Section II. Pileus glabrous, *dry;* taste acrid.

66. Lactarius piperatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 27.
Cooke, Ill., Pl. 979.
Patouillard, Tab. Analyt., No. 119.
Michael, Führer f. Pilzfreunde, Vol. I, No. 37.
Ricken, Blätterpilze, Pl. 10, Fig. 3.
Marshall, Mushroom Book, Pl. 36, p. 92, 1905.
Atkinson, Mushrooms, Fig. 119, p. 120, 1900.
Hard, Mushrooms, Fig. 128, p. 166, 1908.
White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 9, op. p. 30.
Plate IX of this Report.

PILEUS 4-12 cm. broad, firm, convex-umbilicate, then expanded-depressed, at length infundibuliform, *dry, glabrous,* azonate, *white,* even, *margin* at first involute and *naked,* at length spreading or elevated. FLESH white, compact, thick. GILLS attenuate-subdecurrent, *narrow, very crowded,* dichotomously *forked,* white then cream-yellow. STEM 2-6 cm. long, 1-2 cm. thick, equal or tapering downward, dry, firm, *solid,* glabrous or pruinose, white. SPORES subglobose, nearly smooth, 6-7.5 micr., white. MILK white, unchanging, *very acrid,* copious. *Edible.*

Gregarious or scattered. On the ground in frondose woods of maple, oak, etc.

Throughout the Southern Peninsula, less frequent northward. July-September. Common.

This has the most intensely biting taste of all Lactarii. The acridity disappears in cooking and it can then be eaten with impunity. McIlvaine advises its use in gravy. This species is distinguished from its near relatives by its naked margin and very crowded and dichotomously forked gills which become dingy pale yellowish in age. The photograph of Marshall and the figure of Michael show extreme forms if they refer to this plant. *L. pergamenus* Fr. is said to differ in its longer and stuffed stem, and the pileus is thinner and wrinkled, and is not umbilicate at first; some consider it only a variety. A form occurred near Marquette with merely close gills, and in which the milk changed to pale sulphur-yellow; it had a pleasant odor and is var. *fragrans* Burl. (See Torr. Bot. Club Bull. 14, p. 20, 1908.)

67. Lactarius pyrogalus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 390.
Ricken, Blätterpilze, Pl. 11, Fig. 2.
Patouillard, Tab. Analyt., No. 121.

PILEUS 4-6 cm. broad, convex then plane and depressed, *gray to livid-gray or brownish-gray,* darker in the center, *zoned* toward margin, moist in wet weather but *not viscid,* glabrous, margin at first involute then spreading. FLESH white, compact, thick. GILLS adnate-subdecurrent, *subdistant to distant,* firm, thin, moderately broad, *yellowish.* STEM 3-5 cm. long, 6-10 mm. thick, equal or tapering downwards, glabrous, becoming hollow, concolor or paler, white-mycelioid at base. SPORES subglobose, echinulate, 6-8 micr., pale ochraceous. CYSTIDIA abundant, subcylindrical, 67-70x9 micr. MILK white, *very acrid,* abundant, persisting as coagulated yellowish globules on the edge of the gills. *Poisonous.*

On the ground in woods. Bay View, Marquette, Ann Arbor. July-August. Infrequent.

Known by its distant gills which become yellowish, the subzonate gray pileus and the milk. The milk often remains as coagulated drops on the gills.

68. Lactarius chrysorheus Fr. (Poisonous)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 984.
Gillet, Champignons de France, No. 379.
Ricken, Blätterpilze, Pl. 13, Fig. 4.
Atkinson, Mushrooms, Fig. 123, 1900.

PILEUS 4-10 cm. broad, convex and broadly umbilicate, then expanded-depressed to subinfundibuliform, *dry or subviscid,* glabrous, color variable, *whitish to yellowish tinged incarnate, zoned with dull orange or yellow,* sometimes almost fulvous, spotted, margin at first involute then pruinose-tomentose, then elevated. FLESH whitish then yellowish from the milk, medium thick. GILLS adnate-decurrent, *crowded,* less so in age, *narrow,* some forked at base, thin, white at first, soon dingy yellowish, stained darker in age. STEM 4-6 cm. long, 1-1.5 cm. thick, equal or subequal, pruinose,

glabrescent, even, stuffed then hollow, white, changing to color of pileus with age, sometimes spotted. SPORES subglobose, echinulate, 7-8 micr., white. MILK white, *changing to sulphur-yellow,* copious, very acrid. *Poisonous.*

Subcaespitose or gregarious. On the ground in frondose woods. Ann Arbor, Detroit, Marquette, etc., throughout the state. August-September.

Closely related to *L. theiogalus.* The latter has a more truly viscid pileus which is usually not zoned, and an odor which is well-marked and disagreeable. *L. chrysorheus* is sometimes frequent locally but I have so far not happened upon it in many localities. It may be that it is quite strongly restricted to certain seasons. Fries, Ricken and other European authors describe the pileus as always dry but in the United States it is often subviscid in moist weather. The milk sometimes turns slowly and the taste is occasionally bitter-acrid.

69. Lactarius theiogalus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 396.
Ricken, Blätterpilze, Pl. 13, Fig. 5.
Burlingham, Torr. Bot. Club Mem. 14, Fig. 12, p. 70, 1908.

PILEUS 3-8 cm. broad, convex then expanded, *umbonate, obtuse or depressed,* dry or subviscid, even or wrinkled-uneven, glabrous, *incarnate-isabelline to pale tawny-reddish or fulvous,* obscurely zonate to azonate, margin at first involute soon spreading. FLESH medium thick, compact, white then yellowish from the milk. GILLS adnate-subdecurrent, close, rather narrow, some forked near base, pallid to yellowish-flesh color, reddish-brown where bruised or in age. STEM 3-7 cm. long, 6-12 mm. thick, subequal, firm, *undulate-uneven,* stuffed then hollow, glabrous, concolor or paler, substrigose at base. SPORES "subglobose to broadly elliptical, minutely echinulate, 8-9x6-7 micr., whitish." (Burl.) MILK white, *changing to sulphur-yellow,* tardily but very acrid. ODOR *strong,* pungent, disagreeable. *Suspected.*

Gregarious. On the ground in coniferous woods, sometimes in swampy places. Marquette, Huron Mountains, Houghton, Bay View, New Richmond. July-October. Frequent locally.

This species differs as a rule from the preceding by its umbonate or obtuse pileus, but this is not always reliable. It is necessary to

take into account the odor of the fresh plant, the undulate surface of the stem and the color of the pileus. Usually it lacks the zones which are marked in *L. chrysorheus,* but I have specimens from a sphagnum swamp which show the zones quite well. Miss Burlingham states that it is more zonate in wet places. *L. brevis* Pk. and *L. brevipes* Longyear, are considered by Miss Burlingham as ecological forms of this species. Ricken refers this to the group with pruinose gills; it is, however, too close to the preceding to be placed so far away. Its taste is sometimes bitter at first.

Section III. Pileus glabrous, *viscid;* taste *acrid.*

70. Lactarius insulsus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 975.
Bresadola, Fungh. mang. e. vel., Pl. 62.
Gillet, Champignons de France, No. 386.
Hard, Mushrooms, Fig. 135, p. 171, 1908.
Ibid, Fig. 132, p. 168 (as *L. regalis* Pk.).
Plate X of this Report.

PILEUS 5-10 cm. broad, rigid, convex-umbilicate, then expanded-depressed to infundibuliform, *coppery-orange,* with alternate *zones* of deeper or lighter tones, sometimes paler throughout, *viscid,* glabrous, somewhat uneven, margin at first involute then elevated and arched, naked. FLESH scarcely compact, thick, white. GILLS adnate then decurrent, thin, *narrow,* some forked at base, white then pallid. STEM 2-5 cm. long, 8-15 mm. thick, equal or tapering downward, glabrous, stuffed then hollow, paler than pileus. SPORES globose, strongly echinulate, 7-9.5 micr., pale yellowish. MILK white, unchanging, *very acrid.*

Gregarious to caespitose. On the ground in open frondose woods. Ann Arbor. July-October. Frequent.

This species does not yet seem to be clearly understood. Ricken describes a plant which is scarcely zoned except on the margin and which has very large spores—12-15x10-12 micr. The spore-measurements of Bresadola and Saccardo, on the other hand, agree with ours. Peck's description (N. Y. State Mus. Rep. 38, p. 122) is that of the paler form and has been copied by McIlvaine. Our plants are mostly of the dark yellow to orange type as described by Miss Burlingham, but paler forms also occur. Specimens of the dark form

were sent to Peck who referred them to *L. regalis* Pk. and Dr. Fischer's photograph of it is so named in Hard's book. It is possible that some of our forms represent *L. zonarius* Fr. which is said to have a solid stem, pale orange to yellow-gilvus pileus with a thinner margin. According to Fries (Monographia) *L. insulsus* has the habit and size of *L. deliciosus,* differing in paler colors, acrid taste and white unchangeable milk. Cooke's figure represents our plants well except that they may become darker with age. *L. regalis* is referred by Peck to a variety of *L. resimus* Fr., and is said to be an almost entirely white plant with scarcely noticeable zones, not at all related to *L. insulsus;* its milk changes to sulphur-yellow. The gills of our form of *L. insulsus* sometimes become dingy yellowish in age or where bruised, but the milk is unchangeable. The plants referred to *L. insulsus* by McIlvaine were edible.

71. Lactarius affinis Pk.

N. Y. State Mus. Rep. 23, 1872.
Ibid, (as *L. platyphyllus* Pk.).

PILEUS 6-15 cm. broad, firm, convex-umbilicate then expanded-depressed, *pale yellowish to yellowish-incarnate* or ochraceous-yellow, *azonate, viscid,* glabrous, even, margin involute at first spreading and arched. FLESH white, moderately thick. GILLS adnate-subdecurrent, *broad* or moderately broad, close to subdistant, forked toward base, *creamy-yellowish.* STEM 5-10 cm. long, 1-2 cm. thick, equal, glabrous, stuffed *then hollow,* yellowish to whitish, often spotted. SPORES globose to broadly elliptical, 9-11 micr., echinulate, whitish. MILK white, unchanging, *acrid.*

Gregarious. On the ground in mixed or frondose woods. Marquette, Ishpeming, South Haven, New Richmond, Detroit. July-September. Rather rare.

Often a very large plant, whose pale yellow, zoneless cap and broad subdistant gills set it apart from others. The whole plant has a tendency to be unicolorous, sometimes dark, sometimes paler. Miss Burlingham states that the milk sometimes dries to a pale dull green shade on the gills. Whether it is edible is unknown.

72. Lactarius hysginus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 169, Fig. 2.
Cooke, Ill., Pl. 989.
Ricken, Blätterpilze, Pl. 12, Fig. 4.

"PILEUS 5-7.5 cm. broad, rigid, convex, then plane, umbilicate or slightly depressed, even, *viscid,* obscurely zonate or azonate, *reddish-incarnate, tan-color or brownish-red,* becoming paler with age, the thin margin involute, GILLS adnate-subdecurrent, close, whitish, becoming yellowish or cream-colored. STEM 2-5 cm. long, 6-15 mm. thick, equal, glabrous, stuffed or hollow, colored like the pileus or a little paler, sometimes spotted. SPORES subglobose, whitish or yellowish, 9-10 micr. MILK white, acrid."

On the ground, mixed woods. Houghton. July.

This was found only in the locality mentioned. The description is that of Peck, with which the fresh plants agreed, except that the gills were almost subdistant. The pileus was obscurely zonate. It was found several times, always solitary.

73. Lactarius trivialis Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 976.
Hard, Mushrooms, Fig. 134, p. 170, 1908.

PILEUS 5-15 cm. broad, convex, soon nearly plane and depressed, glabrous, *viscid, azonate,* color varable, *livid-gray to smoky-gray* or with a lilac-purplish tint, lead-colored or pinkish-brown, margin soon arched, at first pruinose, thin. FLESH thickish, rigid-fragile, pallid. GILLS adnate-subdecurrent, close, thin, moderately broad or rather narrow, some forked, cream-yellowish, *becoming dingy-greenish stained when bruised or in age.* STEM 4-12 cm. long, 1-2 cm. thick, equal, or irregularly undulate, glabrous, even, not spotted, stuffed then *hollow,* firm, concolor or paler than pileus, often pallid. SPORES elliptical, echinulate, 8-10 micr., *yellowish.* MILK white or creamy-white, unchangeable, *acrid. Suspected.*

Gregarious, subcaespitose or scattered. On the ground in frondose and coniferous woods.

Throughout the state, from the southern limits to Isle Royale. July-October. Common.

This is one of our commonest Lactarii during some seasons, usually among the first to appear, especially in the frondose regions. It is found in pine, hemlock, mixed, or oak and maple woods throughout the state. The northern form varies somewhat and needs further study; a variety also occurs in the north whose milk turns sordid green after exposure to the air, with broader and more distant gills and a spotted stem. This may be called var. *viridilactis* var. nov. Peck has described var. *maculatus* with zonate pileus and spotted stem, and var. *gracilis* which is quite a small and slender plant. The common form is a rather large plant; the pileus is sometimes up to 18 cm. broad with a dark livid or lurid, indescribable color, and white or creamy-yellowish, acrid milk. When old or faded the pileus becomes much paler and is often pale leather-colored or incarnate-tan. The flesh of the pileus though rigid is rather fragile and the stem is firm but soon hollow or cavernous.

74. Lactarius uvidus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 991.
Gillet, Champignons de France, No. 399.
Ricken, Blätterpilze, Pl. 11, Fig. 4.
Patouillard, Tab. Analyt., No. 209.
Hard, Mushrooms, Fig. 144, p. 180, 1908.

PILEUS 3-7 cm. broad, convex then plane and depressed, rather firm, often subumbonate, *viscid,* obscurely or not at all zonate, sometimes spotted, *cinereus with lilac tinge or livid brownish-gray*, margin at first involute and subpruinose, thin and spreading. FLESH whitish, *becoming lilac or violet when cut,* usually rather soft when moist. GILLS adnate-subdecurrent, thin, close, rather narrow, white or yellowish, *quickly becoming violet or lilac when bruised.* STEM 4-7 cm. long, 6-12 mm. thick, subequal, glabrous, uneven-undulate, viscid, white or dingy yellowish, stuffed then hollow or cavernous. SPORES subglobose or broadly elliptical, 8-10 micr., echinulate, white. MILK white, *changing quickly when in contact with the flesh to lilac-violet,* bitterish-acrid.

Gregarious. On the ground in low, mossy places in swamps, thickets, etc. Bay View, Houghton, Marquette. August-September. Infrequent.

Known by the flesh changing to lilac or violet when cut or bruised. It is found in rather wet places, sometimes attached to moss and

sphagnum and then the base of the stem is white-tomentose. It seems to be most frequent in the Northern Peninsula. Its edibility is uncertain; it is considered poisonous in Europe.

75. Lactarius maculatus Pk. (Suspected)

N. Y. State Mus. Rep. 41, 1888.

PILEUS 8-12.5 cm. broad, convex-umbilicate, then expanded-depressed to infundibuliform, grayish-buff to grayish-lilac, *distinctly zoned with concentric darker spots,* viscid when moist, glabrous, margin at first involute, naked, then spreading and substriate. FLESH grayish, *becoming lilac where bruised,* rather compact. GILLS adnate-subdecurrent, close, broadest in the middle, attenuate behind, whitish to cream-color, *lilac-vinaceous where wounded.* STEM 3-7 cm. long, 1.5-3 cm. thick, subequal, ventricose or tapering, hollow, sometimes compressed, *spotted-variegated,* concolor, glabrous. SPORES "subglobose, echinulate, 10-12.5 micr." (Peck.) MILK at first white to cream color, unchanged or becoming lilac on the flesh, *acrid.*

On sandy ground, oak and maple hillside along Lake Superior, Marquette. August. Rare.

This is closely related to *L. uvidus,* differing from it in its distinctly zonate pileus, larger size and spotted stem. The milk in our specimens remained unchanged. It is likely that the milk in both *L. uvidus* and *L. maculatus* sometimes turns lilac-vinaceous, that at other times it remains unchanged except to cause the broken flesh where it is touched by the milk to assume a lilac-vinaceous color.

Section IV. Pileus glabrous, viscid; taste *mild; milk bright-colored from the first.*

76. Lactarius subpurpureus Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, Ibid, 54, Pl. 70, Fig. 1-6.
Burlingham, Torr. Bot. Club Mem. 14, Fig. 8, p. 61, 1908.

PILEUS convex-umbilicate, then expanded-depressed to subinfundibuliform, *dark red,* pink-zoned, with a grayish lustre, spotted with emerald-green, subviscid when moist, glabrous, margin at first

involute, pruinose, then spreading. FLESH whitish to pinkish, *becoming red when broken especially* next to the gills. GILLS adnate-subdecurrent, close to subdistant, broadest in middle, medium broad, *dark-red,* fading and *greenish with age.* STEM 3-7 cm. long, 6-15 mm. thick, equal or tapering upwards, glabrous, sometimes pruinose, stuffed then hollow, *dark red, spotted more deeply,* floccose-hairy at base. SPORES "broadly elliptical, echinulate, 8-10x7-8 micr., yellowish." (Burl.) MILK *dark red,* mild. *Edible.*

Gregarious. Low moist woods of hemlock or mixed with hemlock. Bay View, Huron Mountains. August-September. Infrequent.

Easily distinguished by its dark red milk which stains the flesh of the broken plant; later the stains assume a greenish hue. Dried specimens do not show this character well, since they become much paler.

77. Lactarius deliciosus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 6.
Gillet, Champignons de France, No. 382.
Cooke, Ill., Pl. 982.
Bresadola, Fungh. manger. e. vel., Pl. 64.
Peck, N. Y. State Mus. Rep. 48, Pl. 29, 1896.
Atkinson, Mushrooms, Pl. 35, Fig. 1, 1900.
Gibson, Edible Toadstools, Pl. 18, p. 169, 1903.
Michael, Führer f. Pilzfreunde, Vol. I, No. 37.
Swanton, Fungi, Pl. 15, Fig. 6-7.
Plate XI of this Report.

PILEUS 5-10 cm. broad, convex-umbilicate, then expanded-depressed to subinfundibuliform, viscid when moist, glabrous, *orange or grayish-orange,* fading to grayish in age, *zoned,* zones or spots brighter-colored, involute at first then arched-spreading. FLESH white soon stained orange when broken, then greenish, especially at junction of gills and pileus. GILLS adnate-decurrent, close, rather narrow, intervenose and more or less forked, *bright orange with yellowish sheen,* becoming greenish in age or where bruised. STEM 3-8 cm. long, 8-15 mm. thick, *equal,* even, stuffed then hollow, pruinose, glabrescent, *orange-yellow, orange-spotted or at length greenish-variegated.* SPORES subglobose, echinulate, 8-10x7-8 micr., yellowish. MILK *orange* or *saffron-yellow, mild.*

Gregarious-subcaespitose. On the ground in moist mossy woods in coniferous regions, under hemlock, balsam-fir, spruce, cedar, birch, etc. Isle Royale, Huron Mountains, Marquette, Munising, Houghton, Bay View. July-September. Frequent locally.

The most desirable perhaps of all the Lactarii for the table, but not very common in southern Michigan at least. Its orange milk and the beautiful zones of the cap have frequently attracted the artist, and it has often been illustrated. Its range with us seems to be mostly northward. This statement is based on seven years of collecting in southern Michigan, but does not exclude the possibility of the appearance of *L. deliciosus* when least expected and perhaps in quantity. Such sporadic fruiting is not infrequent in other mushrooms after they seem to be absent from a region. Peck says it occurs in all kinds of woods, but so far it has been found in quantity only in the northern part of the state. Michael says that because of its strong aromatic taste it is not so desirable as food when served alone but as an addition to other dishes it is excellent.

78. **Lactarius indigo** Schw. (Edible)

Syn. Fung. Carol. Super., 1818.
(Fries, Epicrisis, 1838).

Illustrations: Atkinson, Mushrooms, Pl. 35, Fig. 3, 1900.
McIlvaine, Thousand Amer. Fungi, Pl. 41, Fig. 2.

PILEUS 5-12 cm. broad, convex-subumbilicate, then expanded-depressed to infundibuliform, *indigo-blue or paler,* fading when dry, with a silvery-gray lustre, *zonate,* glabrous. FLESH blue, greenish in age. GILLS adnate-decurrent, close, rather broad, *indigo-blue or paler,* at length pale greenish. STEM 2-5 cm. long, 1-2 cm. thick, equal or tapering downward, glabrous, even, stuffed then hollow, *indigo-blue,* often paler and *spotted.* SPORES "globose to broadly elliptical, echinulate, 7 micr., yellowish." MILK *dark blue, mild. Edible.*

Gregarious. On the ground in oak and maple woods, and sandy pine forests. Ann Arbor, Huron Mountains. Evidently throughout the state. August. Rather rare.

No one can mistake this mushroom as it has no double. It occurs sparingly, but is widely distributed. Schweinitz should be given full credit for naming this striking plant. It seems to be exclusively North American.

RUSSULARIA: Gills becoming darker in age, and then pruinose.

Section V. Pileus minutely scaly, tomentose, pruinose-velvety, dry; taste slowly or slightly acrid.

79. Lactarius fuliginosus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 996.
Gillet, Champignons de France, No. 384.
Patouillard, Tab. Analyt., No. 322.
Ricken, Blätterpilze, Pl. 12, Fig. 5.
Atkinson, Mushrooms, Fig. 117, p. 119, 1900.

PILEUS 2-6 cm. broad, convex, soon expanded-plane or obtuse, sometimes depressed, *dry, even,* minutely velvety-tomentose or glabrous, *azonate,* isabelline or grayish-brown, *clouded with a smoky shade,* margin at length crenate-wavy. FLESH thin on margin, whitish, *becoming tinted with flesh-pink to salmon-color when broken.* GILLS adnate, at length subdecurrent, distinct, close to subdistant, moderately broad, *pruinose,* pallid then pale ochraceus, *becoming pinkish or salmon when bruised.* STEM 2-6 cm. long, *often short,* 3-10 mm. thick, subequal or tapering downwards, stuffed then hollow, minutely pruinose-velvety or glabrous, pallid-grayish-isabelline or smoky-clouded, pinkish-stained where bruised. SPORES globose, echinulate, 7-9 micr. with long sterigmata, *pale ochraceous-yellow.* MILK white at first, then *changing slowly to flesh-pink or salmon* where in contact with the flesh, *slowly acrid.*

Gregarious. On the ground in frondose woods of oak and maple. Ann Arbor. August. Infrequent.

In Europe it is said to occur also in pine woods. It is known by its smoky-clouded often "snuff-brown" pileus, and the tendency of the flesh to assume a flesh-pink or pale salmon color where bruised. Dry weather plants often respond slowly to bruising. The margin of the pileus in age is apt to be wavy or scalloped. *L. gerardii* Pk. is considered by Atkinson as probably a variety.

80. Lactarius lignyotus Fr. (Poisonous)

Monographia, 1863.

Illustrations: Fries, Icones, Pl. 171, Fig. 1.
Michael, Führer f. Pilzfreunde, Vol. II, No. 58.
Atkinson, Mushrooms, Fig. 116, p. 117, 1900.
Hard, Mushrooms, Pl. 21, Fig. 236, p. 172, 1908.
Peck, N. Y. State Mus. Bull. 150, Pl. 123, 1911.

PILEUS 3-7 cm. broad, convex, soon almost plane, *umbonate,* sometimes slightly depressed and then obsoletely umbonate, *dry,* azonate, *pruinose-velvety,* even or *mostly uneven-rugulose* toward *the center,* chocolate or seal-brown to sooty, margin wavy or subplicate in age. FLESH white, *slowly pinkish or reddish where wounded.* GILLS adnate-subdecurrent, close to subdistant, moderately broad, *at first pure white,* then ochraceus, reddish or pinkish where bruised. STEM 4-8 cm. long, 4-12 mm. thick, equal or *abruptly plicate at apex,* pruinose-velvety, sometimes scarcely velvety, *sooty-brown,* spongy-stuffed. SPORES globose, 8-9 micr., echinulate, yellowish, sterigmata long. MILK white, changing slowly to reddish-pink where in contact with flesh, *mild* or subacrid. *Poisonous.*

Gregarious. On the ground in woods, especially in coniferous regions. Marquette, Huron Mountains, Bay View, Ann Arbor. July-September. Infrequent.

Differs from the preceding in the darker color, the rugose pileus and longer and more velvety stem. Efforts which I made to differentiate the two by microscopical characters remained abortive. Both possess slender, cylindrical, aculeate sterile cells on the edge of the gills, about 4 micr. in diameter. The trama of the gills in the specimens examined was more filamentous in *L. lignyotus* and had a floccose structure of spherical cells in *L. fuliginosa.* The two species, however, appear to run into each other at times.

81. Lactarius helvus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 994.
Bresadola, Fung. Trid., Pl. 127 and 39.
Ricken, Blätterpilze, Pl. 13, Fig. 2.

PILEUS 4-12 cm. broad, *fragile,* convex then plane and depressed

with decurved margin, with or without an obscure umbo, azonate, *dry, floccose-scaly, tawny-isabelline,* fading, margin at first involute then spreading. FLESH somewhat watery. GILLS subdecurrent, thickish, close to subdistant, rather narrow, broadest behind, whitish then ochraceous tinged incarnate, pruinose. STEM 5-8 cm. long, (up to 15 cm. long on sphagnum), 5-15 mm. thick, subrigid-fragile, subequal, *pruinose-pubescent,* stuffed then cavernous, concolor, white-mycelioid at base. SPORES globose, 7-9 micr., echinulate. MILK *watery,* rarely white, sparse, mild or scarcely acrid. ODOR *fragrant,* like that of *L. camphoratus.*

Gregarious or scattered. On the ground or on moss in low swampy woods, or on sphagnum in peat-bogs, sometimes among moss along exposed borders of lakes, etc. Ann Arbor and elsewhere in the lake regions of the interior. July-Sept. Frequent locally.

This is for the most part included under var. *aquifluus* by Peck but the watery character of the milk is apparently merely a result of the moist habitat.

82. Lactarius rufus Fr. (Poisonous)

Epicrisis, 1836-38.

Illustrations: Fries, Sverig. Svamp., Pl. 11.
Cooke, Ill., Pl. 985.
Gillet, Champignons de France, No. 391.
Ricken, Blätterpilze, Pl. 13, Fig. 3.
Michael, Führer f. Pilzfreunde, Vol. I, No. 36.
Swanton, Fungi, Pl. 7, Fig. 3-4.

PILEUS 4-10 cm. broad, convex then expanded-depressed to infundibuliform, *umbonate,* flocculose-silky, *glabrescent,* azonate, dry, *bay-red to rufous,* not fading, subshining, margin at first involute. FLESH rather thin, rather soft when moist. GILLS adnate-decurrent, close, at length pruinose, narrow, *ochraceous then rufous.* STEM 5-8 cm. long, (longer in moss), 6-12 mm. thick, equal, dry, glabrous, sometimes pruinose, stuffed then hollow, firm, *rufous or paler,* often strigose-hairy at base. SPORES sub-globose, 7-8 micr., slightly echinulate, white. MILK white, unchanging, *very acrid.* ODOR *none. Poisonous.*

On the ground in hemlock and pine woods. New Richmond. September. Infrequent or local.

Known by its red-brown color, umbonate pileus, very acrid taste

and rather large size as compared with others of the same color. Peck has segregated a species on the lack of the umbo, the hollow stem and scanty milk; it is edible. This he named *L. boughtoni* Pk. (see N. Y. State Mus. Bull. 150, p. 32, and Pl. 6, Fig. 1-7). It seems to be an extreme form of *L. rufus* and may be referred to as var. *boughtoni* Pk. Longyear has reported *L. rufus* from a swamp near Lansing where it occurred in large numbers. I have seen it only in the Adirondack Mountains, New York.

83. Lactarius griseus Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustrations: Burlingham, Torr. Bot. Club, Mem. 14, Fig. 14, p. 18, 1908.

Hard, Mushrooms, Fig. 138, p. 174, 1908.

PILEUS 1-4 cm. broad, soon flaccid, convex then depressed to infundibuliform, *papillate, dry,* azonate, *minutely tomentose,* becoming floccose, *grayish* or brownish-gray, variegated smoky-gray, margin at first incurved. FLESH white, *thin.* GILLS adnate-decurrent, close to subdistant, pruinose, broader than the thickness of the pileus, white *then cream-colored to honey-yellow.* STEM 1-5 cm. long, 2-5 mm. thick, equal, dry, glabrous, stuffed then hollow, whitish to grayish. SPORES broadly elliptical to subglobose, 8-9x6-7 micr., echinulate, white. MILK white, unchanging, *slowly acrid.*

Gregarious or scattered. On the ground or on much decayed logs in woods of the coniferous regions of the state. Marquette, Houghton, Huron Mountains, Sault Ste. Marie, Bay View, New Richmond.

Distinguished by its small size, gray color and tomentose-flocculose cap. It differs from *L. cinereus* in its dry, non-glabrous pileus and in the gills becoming cream-yellow in color. It seems to be limited to regions with conifer trees, although it is also found in frondose woods of such regions.

Section VI. Pileus glabrous, *viscid;* taste *acrid.*

84. Lactarius cinereus Pk.

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Burlingham, Torr. Bot. Club, Bull. 14, Fig. 11, p. 67, 1908.

Hard, Mushrooms, Fig. 137, p. 173, 1908.

PILEUS 1-5 cm. broad, lax, convex-umbilicate, soon expanded-depressed to subinfundibuliform, *viscid* when moist, azonate or subzonate, *glabrous,* even, *cinereous,* margin involute at first then spreading. Thin. FLESH white. GILLS adnate, close, narrow, *white,* not yellowish in age, often pruinose. STEM 2-6 cm. long, 6-12 mm. thick, subequal or tapering slightly upwards, stuffed-spongy then hollow, glabrous, *cinereus,* tomentose at base. SPORES subglobose, echinulate, 6-7.5 micr., *white.* MILK white, unchanging, *acrid.*

Gregarious. On the ground in coniferous and mixed woods of the hemlock regions of the state. Isle Royale, Huron Mountains, Marquette, Houghton, New Richmond. July-September. Infrequent.

Miss Burlingham distinguishes a distinct species which is named *L. mucidus* Burl., which differs from *L. cinereus* in its putty-colored cap with sepia center, and in that the milk stains the flesh and gills blue-grayish-gray. It is said to occur under hemlock but according to this author the true *L. cinereus* is said to be restricted to beech woods. Our plants grew under hemlock, birch, maple and pine. I have no record concerning beech. It is probable that our plants are to be referred to *L. mucidus;* in that case I have no record of *L. cinereus* to which I have always referred these collections. My notes are not sufficient to settle the matter.

85. Lactarius vietus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 170, Fig. 1.
Cooke, Ill., Pl. 1009.
Gillet, Champignons de France, No. 401.
Michael, Führer f. Pilzfreunde, Vol. III, No. 71.
Ricken, Blätterpilze, Pl. 14, Fig. 1.

PILEUS 3-6 cm. broad, convex then depressed or subinfundibuliform, *viscid* when moist, *azonate,* minutely silky-tomentose when dry, *drab-colored or lilac-grayish,* margin involute at first then elevated and arched. FLESH whitish. GILLS adnate-decurrent, close, narrow, *pruinose,* cream color then drab or dingy yellowish, *stained grayish when bruised.* STEM 3-7 cm. long, 5-10 mm. thick, equal or tapering upwards, stuffed then hollow, glabrous or glaucous, rivulose-wrinkled, concolor, tinged drab within. SPORES, globose, echinulate, 6-8 micr., cream-buff in mass. MILK white, unchanged, *very slowly acrid.*

Gregarious on the ground, mixed hemlock, beech and maple woods. New Richmond. Infrequent.

Sometimes the whole plant including the gills is pinkish-buff or incarnate. The grayish hue is more marked in age. It is said to be under suspicion.

86. Lactarius croceus Burl.

Torr. Bot. Club, Mem. 14, 1908.

Illustration: Ibid, Fig. 3, p. 38.

PILEUS 5-10 cm. broad, broadly convex-umbilicate then depressed to infundibuliform, *viscid,* azonate or obscurely zonate, micaceous when dry, *orange to saffron-yellow,* glabrous, margin at first involute and pruinose-downy. FLESH rather thin, whitish, *staining yellow or ochraceous where cut.* GILLS adnate-decurrent, close to *subdistant,* moderately broad, rarely forked, pallid to pale yellow or incarnate-tinged, *changing to cadmium-yellow where bruised.* STEM 3-6 cm. long, 1-2 mm. thick, equal, stuffed then hollow, glabrous, pale orange-yellow, spotted. SPORES globose to broadly elliptical, echinulate, 6-8 micr., pale yellow. MILK white, scanty, slowly changing to yellow, acrid or bitter, often slowly acrid.

Gregarious or scattered. On the ground in woods of oak, maple, elm, etc. Detroit. August-September. Local.

This approaches *L. aurantiacus* Fr. if indeed it is not identical. That species is said to be poisonous. The milk, flesh and gills of the European species do not change color like ours. I have found it at different times, always in the same woods near Detroit. Miss Burlingham reports it from Vermont and North Carolina, and identified our specimens as the same.

Section VII. Pileus glabrous, *dry;* taste *acrid or bitter-astringent.*

87. Lactarius colorascens Pk.

N. Y. State Mus. Bull. 94, 1905.

PILEUS 2-6 cm. broad, nearly plane, then depressed, whitish at first, then *reddish-buff to brownish-red,* azonate, dry or subviscid, glabrous. FLESH thin. GILLS adnate, narrow, crowded to close, whitish *soon brownish-red.* STEM 3-6 cm. long, 5-10 mm. thick,

glabrous, equal, stuffed, often compressed, even, whitish, *soon concolor*. SPORES "globose, echinulate, 8 micr." (Peck.) MILK white, *changing to sulphur-yellow,* bitter or slightly astringent.

On the Ground in mixed woods. Marquette, New Richmond. August-September. Rare or local.

It has the color of *L. camphoratus* when mature, but the milk turns decidedly sulphur-yellow. Found so far only in coniferous regions.

88. Lactarius isabellinus Burl.

Torr. Bot. Club, Bull. 34, 1907.

Illustration: Ibid, Fig. 15, p. 103.

PILEUS 2-5 cm. broad, convex then expanded-depressed, subumbonate, azonate, *dry,* glabrous, wrinkled on disk, *red-fulvous* when moist, paler on margin, fading, margin at length short-striatulate. FLESH thin, white, *staining yellowish from the milk.* GILLS adnate-subdecurrent, thin, close, narrow, forking toward base, pale yellowish, *soon ochraceous-fulvous.* STEM 2-4 cm. long, 4-6 mm. thick, equal, stuffed then hollow, glabrous, *concolor,* white-tomentose at base. SPORES "slightly echinulate, white, 7-8.5x6-7.5 micr." (Burl.) MILK white or watery, at *length sulphur-yellow on flesh,* abundant, slowly *acrid or astringent.*

On the ground in mixed woods, in coniferous regions. Marquette. August. Rare or local.

Could easily be mistaken for a large form of *L. subdulcis,* but the striations of the pileus, the taste and the changing milk differentiate it. No specimens were retained. In age, the milk seems to be sparse and its change can not then be noticed.

89. Lactarius parvus Pk.

N. Y. State Mus. Rep. 29, 1878.

PILEUS 1-3 cm. broad, broadly convex then expanded, subdepressed, obsoletely papillate, *dry,* azonate, glabrous, *pale lilaceus-umber,* fading, margin at first involute. FLESH thin. GILLS adnate-decurrent, close to crowded, narrow, few forked at base, dingy white or ochraceus-tinged, *becoming obscurely greenish then dingy-brown where bruised.* STEM 2-3 cm. long, 3-5 mm. thick, subequal, glabrous or pruinose above, stuffed then hollow and *often*

compressed, sometimes sulcate, tinged with same color as pileus. SPORES subglobose, slightly echinulate, white, 6.5-8 micr. MILK white, unchanging, sometimes slightly changed on flesh, *acrid.* ODOR none.

Gregarious or scattered. On the ground or much decayed wood in forests of hemlock and pine or in cedar swamps. New Richmond. August-September. Frequent locally.

This is one of our smallest Lactarii. The umber color of cap and stem, and the peculiar dingy-greenish tints assumed by the wounded gills characterize it. It closely approaches *L. varius.*

90. Lactarius varius Pk.

N. Y. State Mus. Rep. 38.

PILEUS 3-6 cm. broad, convex then plane and depressed, *grayish-buff or darker,* with tinge of lilac, *dry, micaceous-shining,* azonate or slightly zonate on margin. Flesh thin, white. GILLS adnate-subdecurrent, close, narrow, subventricose, whitish to cream-colored, *stained dingy greenish-brown where bruised. STEM* 2-5 cm. long, 4-6 mm. thick, equal, glabrous, firm, *spongy-stuffed,* concolor or paler. SPORES globose, white, 7-8 micr. MILK white, unchanging, slowly acrid. ODOR none.

Gregarious. On the ground in mixed woods. Marquette. August.

This species is very close to the preceding. It is known by its pale colors both when fresh and in herbarium specimens. It was found only in the Northern Peninsula.

Section VIII. Pileus glabrous or pruinose velvety, *dry;* taste *mild.*

91. Lactarius volemus Fr. (Edible).

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 10.
Cooke, Ill., Pl. 999.
Gillet, Champignons de France, No. 402.
Bresadola, Fungh. mang. e. vel., Pl. 66.
Ricken, Blätterpilze, Pl. 14, Fig. 3.
Patouillard, Tab. Analyt., No. 323.
Peck, N. Y. State Mus. Rep. 48, Pl. 30.
White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 10.

Michael, Führer f. Pilzfreunde, Vol. I, No. 35.
Hard, Mushrooms, Fig. 142, p. 179.
Plate XII of this Report.

PILEUS 5-12 cm. broad, firm, convex then expanded-depressed, plane or obtuse, *dry,* azonate, *glabrous,* even or becoming rimose-areolate or rivulose, *unicolorous, orange-fulvous or brownish orange* to tan-brown, often pale, margin at first involute then spreading. FLESH compact, rigid, whitish, sometimes brownish. GILLS adnate-decurrent, close, moderately broad, white or yellowish, darker with age or brownish where bruised, somewhat forked. STEM 3-10 cm. long, 1-2 cm. thick, subequal, glabrous or pruinose, *solid,* rarely cavernous, concolor or paler. SPORES globose, echinulate, 7-10 micr., white. MILK white, unchanging, *mild, abundant.* ODOR slight when fresh, strong on drying. *Edible.*

Gregarious or scattered. On the ground in frondose woods and open places, throughout the southern part of the state. July-September. Common.

Like *L. deliciosus,* this species is very delicious when properly prepared. It can be cut up and dipped in egg and bread crumbs and fried like oysters; it is also excellent when grated and then baked and served on toast. The milk is copious and white. It is not likely to be confused with others except *L. corrugis and L. hygrophoroides,* both of which are similarly colored, but as they are edible no harm results. It must not be confused, however, with *L. rufus* which is considered poisonous. I have been unable to find *L. volemus* in the coniferous regions of the northern and western parts of the state, although it probably occurs there.

92. Lactarius corrugis Pk. (Edible)

N. Y. State Mus. Rep. 32, 1880.

Illustrations: Atkinson, Mushrooms, Fig. 115, p. 115, 1900.
Hard, Mushrooms, Fig. 141, p. 177, 1908.

PILEUS 6-12 cm. broad, firm, convex then depressed-expanded, dry, azonate, *minutely velvety* (spicules!), *corrugate or rugose-reticulate,* dark reddish-brown to rufous-tawny, sometimes paler, margin involute at first then spreading and arched. FLESH compact, white, thick. GILLS adnate-decurrent, close, somewhat narrow, sometimes forking, yellowish-cinnamon, *becoming fulvous-brown where bruised,* provided *with dark-colored spicules* which give them

the brown color. STEM 6-7 cm. long, 1.5-2.5 cm. thick, *stout,* firm, solid, equal, dry, more or less tinged concolor and subvelvety. SPORES globose, echinulate, 9-12 micr., white. MILK white, unchanging, *mild,* copious. ODOR slight.

Gregarious or solitary. On the ground in frondose woods or open places. Detroit, Ann Arbor. August-September. Infrequent.

Closely related to the preceding, of which it might be considered a variety. The rugose or corrugated pileus and the abundance of brown spicules on the gills are the main distinguishing characters.

93. Lactarius hygrophoroides B. & C. (Edible)

Ann. & Mag. Nat. Hist., Vol. III, 1859.
N. Y. State Cab. Rep. 23, 1872 (as *L. distans* Pk.).

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 53, Fig. 7-11, 1900.

PILEUS 3-8 cm. broad, rarely broader, firm, convex then expanded, umbilicate or subdepressed, glabrous or minutely velvety-pubescent, *dry,* sometimes rugose-wrinkled or rimose-areolate, *yellowish-tawny, fulvous or paler,* margin involute then spreading. FLESH somewhat brittle, whitish, thick. GILLS adnate-subdecurrent, *distant,* narrow, often intervenose, whitish to cream-yellowish. STEM 2-4 cm. long, *short,* 8-16 mm. thick, equal or tapering downward, *solid,* glabrous or pruinose, *concolor.* SPORES globose to broadly elliptical, 9-11 micr., minutely echinulate, white. MILK white, unchanging, *mild. Edible.*

Gregarious or scattered. On the ground in frondose woods or open places. Ann Arbor, Lansing, etc., throughout southern Michigan. July-August. Sometimes common.

This species has the color of *L. volemus* but has distant gills, a short stem and is usually smaller in size. It was described as *L. distans* by Peck and it is regrettable that this appropriate name could not be retained, as the distant gills are its most striking characteristic. However, specimens of Curtis' collections are still in existence and show the plant to have been described by Berkely, as *L. hygrophoroides.* It is equally as good to eat as *L. volemus.*

94. Lactarius luteolus Pk.

Torr. Bot. Club, Bull. 23, 1896.

Illustrations: N. Y. State Mus. Bull. 67, Pl. 83, Fig. 7-11, 1903.

PILEUS 3-7 cm. broad, firm, convex or nearly plane, sometimes umbilicately depressed and subpapillate, *minutely pruinose-velvety, dry,* azonate, more or less rugose, yellowish or dingy buff, margin involute at first. FLESH white, *becoming brown when bruised.* GILLS adnate-subdecurrent, close, narrow, whitish, *becoming brown when bruised.* STEM 2.5-5 cm. long, 3-10 mm. thick, subequal, dry, glabrous or pruinose, firm, spongy-stuffed, *whitish or buff.* SPORES globose, echinulate, 7-8 micr., white. MILK white or whitish, *changing to brown on the flesh,* copious, mild. ODOR mild or foetid.

On the ground in mixed woods. Marquette. August. Rare.

To this species evidently belongs *L. foetidus* Pk. (N. Y. State Mus. Bull. 54, p. 949, 1902), which is a form with a foetid odor.

Section IX. Pileus glabrous, dry or subviscid, taste *mild;* milk white, pale or watery.

95. Lactarius subdulcis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 393.
Cooke, Ill., Pl. 1002.
Michael, Führer f. Pilzfreunde, Vol. II, No. 55.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 5.
Hard, Mushrooms, Fig. 140, p. 176.

PILEUS 2-5 cm. broad, firm, convex then depressed or subinfundibuliform, often papillate, *azonate, dry,* glabrous, *brownish-red,* isabelline or reddish-fulvous, sometimes paler, *not fading,* even or subwrinkled. FLESH whitish or tinged fulvous. GILLS adnate-decurrent, close, *pruinose,* sometimes forked, rather narrow, whitish soon pallid yellowish-flesh color, often fulvous-stained. STEM 4-7 cm. long, 2-8 mm. thick, subequal, stuffed then hollow, glabrous or pubescent to tomentose toward base, even or wrinkled-lacunose. *concolor or* paler than pileus. SPORES globose, echinulate, 7-8

micr., white. MILK white or watery-white, unchanging, *mild* or slightly acrid or bitterish in the throat. *Edible.*

On the ground in low woods, fields, copses, swamps and wet places or in mixed or frondose woods. Throughout the state. June-October. Very common.

This species occurs in dry weather when hardly any other mushroom is to be found, and a swamp or bog must be very dry if it does not yield some. In wet weather it is to be found on high ground as well, either in the woods or the bare soil in fields or roadsides, sometimes even on decayed wood. It is very variable and several varieties have been named, e. g. (a) with cinnamon-red pileus; (b) with chestnut-red pileus and spongy stem, and (c) with varnished-shining bay-red cap and hollow stem. Ricken says the European form is best known by the red-strigose base of the stem and the tufted mode of growth. With us it is usually gregarious or scattered. It must not be confused in dry weather with *Clitocybe laccata* when the latter is moist and then similarly colored. That species differs in its distant gills and fading pileus, and never possesses milk.

96. Lactarius oculatus (Pk.) Burl. (Edible)

Torr. Bot. Club, Bull. 34, 1907.

Illustration: Peck, N. Y. State Mus. Bull. 67, Pl. 83, Fig. 20-24 (as *L. subdulcis* var. *oculatus* Pk.).

PILEUS 1-2 cm. broad, convex-expanded, *abruptly papillate-umbonate,* viscid when moist, glabrous, *fulvous,* fading to pinkish, umbo-darker and scarcely fading, margin at first involute then spreading. FLESH whitish, thin. GILLS subdecurrent, medium close, *broad,* pruinose, pallid then yellowish. STEM 2-4 cm. long, 2-5 mm. thick, equal, glabrous, stuffed, *concolor* or paler. SPORES globose to broadly elliptical, echinulate, 7-9.5 micr., white. MILK white, sparse, unchanging, *mild.*

On the ground in moist places in woods, or on moss. Ann Arbor. July-September. Infrequent.

Related to the preceding, but often with a distinct viscidity on the expallent pileus. Its definite and persistent papilla has been called the "eye spot" of the cap, since its darker color, especially after the rest of the pileus is faded, makes it appear prominent.

97. Lactarius camphoratus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1013.
Ricken, Blätterpilze, Pl. 14, Fig. 7.
Plate XIII of this Report.

PILEUS 1-4 cm. broad, firm, rigid-fragile, convex, often umbonate, at length depressed, *fulvous to dark brownish-red,* azonate, dry, glabrous, often wrinkled-uneven, *opaque,* margin arched-decurved. FLESH concolor or paler, rather thin. GILLS adnate-subdecurrent, close, rather narrow, pruinose, dull yellowish to reddish-brown. STEM 1-3 cm. long, 3-8 mm. thick, subequal, glabrous or pruinose, sometimes compressed-wrinkled, spongy-stuffed, *concolor.* SPORES globose, echinulate, 6-7.5 micr., white. MILK white, unchanging, either copious or in dry weather often watery white and scanty, *mild.* ODOR *aromatic, agreeable,* usually very distinct. *Edible.*

On the ground in wet places, swamps, very rotten wood in mixed or frondose woods. Throughout the state. July-August. Common.

Known by its peculiar rigid-fragile consistency, its aromatic odor and dark reddish-brown color. Distinguished from *L. rufus* which grows in similar situations, by its smaller size, odor and non-acrid taste; from *L. subdulcis* by darker color and odor. The odor is not of camphor as the name would indicate; it has been variously characterized as like that of dried melilot, slippery-elm bark, or chicory, or similar to that of *L. helvus.* Like *L. subdulcis,* it is often to be found when other mushrooms are absent.

98. Lactarius rimosellus Pk.

N. Y. State Mus. Bull. 105, 1906.

Illustration: Ibid, Pl. 95, Fig. 7-11.

"PILEUS 3-6.5 cm. broad, rather firm, convex umbonate, then depressed, *brownish terra-cotta,* fading somewhat, azonate, dry, glabrous, rugose from the center, *at length minutely rimose-areolate.* FLESH thin, isabelline then concolor. GILLS decurrent, close, medium broad, few forking, whitish then somewhat ochraceous. STEM 2-6 cm. long, 5-10 mm. thick, equal or tapering upwards, stuffed then hollow, pruinose above, *tomentose to strigose downwards,* concolor. SPORES broadly elliptical, echinulate, 7-8 micr.,

white. MILK *watery or watery-white,* unchanged, mild or slightly woody. ODOR faint, somewhat like that of *C. camphoratus.*"

On the ground in open places or in wet places in woods. Ann Arbor. August. Rare.

Differs from *L. camphoratus* in that the pileus becomes rimose-areolate and fades somewhat in age, and in its more tomentose stem.

Russula Fr.

(From the Latin, *russula,* reddish.)

Veil none; the trama composed of *vesiculose* tissue, *without a milky juice;* gills rigid, fragile, acute on edge; stem central, confluent with the pileus; spores globose or subglobose, usually echinulate or verrucose, white cream-color, yellow or ochraceous.

Fleshy, putrescent, rigid-brittle mushrooms, mostly terrestrial, a few on much decayed wood, on sphagnum or on other mosses. A very distinct genus, most closely related to Lactarius, from which it differs by its lack of a milky juice. Hygrophorus differs in the thicker and more waxy nature of the gills although here there are evident certain signs of relationship with species of Russula. Almost all of the species are *edible* after careful cooking since even the peppery forms then lose their sharp taste; in any case the mild species are perfectly safe when fresh, young and clean.

The PILEUS may be red, purple, violet, bluish, yellow, green or white, except in the Compactae, a differentiated pellicle is present on the surface of the cap. This pellicle is often composed of more or less gelatinous hyphae and becomes viscid in wet weather, or it may remain dry and become pruinose or velvety. The pellicle is somewhat separable along the margin of the pileus and in many of the Fragiles can be peeled easily on the whole surface. The margin of the pileus is often striate at least in age. In the species with a thin cap, the lines of attachment of the gills to the cap show through as raised ridges which are often tuberculate because of the presence of the interspacial veins beneath and these striae may extend far toward the center of the pileus. In the species with firm and thick caps, the striations are not as marked or are obscurely developed on the margin only when the plant becomes old. Still, this character is so variable that it must be used with caution as a diagnostic character. The surface is usually glabrous or merely pruinose to velvety; the latter appearance is due to cystidia-like erect hyphae closely covering the pellicle. The GILLS of the differ-

ent species are of all shades between shining white and egg-yellow, and this fact alone separates them from any one of the spore-color groups of the Agaricaceae. Some authors consider the forking of the gills as well as the veining in the interspaces of the gills important diagnostic characters. These two characters are intimately related and forking is for the most part merely a pronounced development of veining. In fact such a large number of species have been observed with veined interspaces and some forked gills that this character loses most of its value. In *R. variata* the forking is dichotomous or mostly so and reaches its highest development. The different lengths of the gills are, on the contrary, much more important characteristics. They may be alternately long and short as in the Compactae, or they may be all of one length with rarely any secondary or shorter gills. Intermediate cases occur in the Subrigidae, but even here the short gills are not numerous. Their shape and width are also of value, since the anterior and posterior ends have a characteristic width which accompanies other characters of the given subgenera. The STEM is usually white, sometimes red or slightly ochraceous, in some species changing to ashy, etc., with age. The reticulations on the surface are obscure and of no diagnostic value. It is usually spongy-stuffed within and may become cavernous in age or hollowed by grubs; in the Compactae, however, it is usually solid. The TRAMA is composed of large bladder-like cells arranged in groups and surrounded by strands of slender hyphae, as in Lactarius. Such a structure is said to be *vesiculose* and accounts for the more or less brittle consistency of the plants. Since the difference in this consistency is accompanied by other good characters, it is made the basis of a division of the genus into its subgenera. The TASTE as in the Lactarius, is sharply acrid in some species, slowly or slightly acrid in others, and entirely mild in a considerable number. This is an important character for the identification of the species and is fairly constant. It is necessary to have fresh plants to be sure in some cases that the acridity is present. Sometimes plants which are apparently mild will be found to have a slight acridity only when very young, or only in the gills and not elsewhere. The ODOR of some species, e. g., *R. foetans*, *R. foetantula*, *R. compacta*, etc., is quite characteristic and should never be unconsidered. One must not confuse this test by applying it to plants already in the first stages of decay. SPORE PRINTS are considered by most as the most essential means of settling the identity of closely related species. It has been claimed that the color is constant and with this claim I agree. It is also

known that the spore prints fade or change after a time, and hence old herbarium spore-prints are not reliable unless accompanied by careful notes of the print when fresh.

The genus may be divided into four natural groups which are here considered as subgenera: Compactae, Rigidae, Subrigidae and Fragiles. Of these, the first and last correspond to the tribes of that name in Fries. (Hymen. Europ.) As shown in a former paper, (Kauffman, Mich. Acad. Sci., Rep. 11, p. 60, 1909), the forking of the gills and the striations on the pileus are not very reliable for the characterization of the main groups. It has seemed practicable to establish a new division, viz., the Subrigidae, to include forms with a pruinose or velvety dry pellicle and rather firm consistency, which are out of place elsewhere, and seem to be closely related. Some have divided the genus into two large groups on the basis of the mild and acrid taste (Massee, British Fungus Flora, Vol. III.). Others have used the spore-color (Schroeter, Pilze Schlesiens and Hennings, Engler. u. Prantl Pflanzenfamilien). Earle has raised the five "tribes" to generic rank (Bull. N. Y. Bot. Gard. 5, p. 373, 1909), and finally, Maire has proposed a division of the genus into eight sections based in part on microscopical characters (Soc. Myc. de. France, Bull. 26, p. 120, 1910). The last author appreciates that the groups of Fries are fairly natural and has kept the main features, while emphasizing the presence or absence of cystidia-like spicules on the surface of pileus and stem. These "cystidia" cause the velvety or pruinose character which I have used in the group Subrigidae. Further studies of all young buttons and their development will aid materially in a proper arrangement, especially with reference to the character of the margin of the very young pileus.

The claim of Maire (l. c.) that microchemical tests can be used to advantage, has been given a trial in ten of the following species. This work was done at my request by Dr. W. B. McDougall in our laboratory during the summer of 1912. The results are appended under the corresponding descriptions of the species studied.

The abbreviations of Maire are used as follows: G = Tincture of Guaiac. S V=Sulfovanilline. F S=Sulfoformalin. The last two are prepared as follows:

Sulfovanilline.

Distilled water	2.cc.
Sulfuric acid, pure	2.cc.
Vanilline (c. p.)	25 g.

Sulfoformalin.

Distilled water 25 drops
Sulfuric acid, pure 5.cc.
Formalin (4% sol.) 75 drops

The action of *guaiac* is to turn the flesh blue and should react in one or two minutes. Sometimes only certain parts of the plant react, e. g., in *R. subpunctata,* the gills are unaffected. The *sulfovanilline* turns the parts blue, sometimes at first pink, while the *sulfoformalin* intensifies the brownish color of the cystidia and the lactiferous hyphae in the gills. We did not test the "cystidia" of the surface of the pileus and stem, where the test was effectively used by Maire. In *R. virescens* and *R. crustosa* the last two chemicals had hardly any effect as compared with the quick reaction in other species. Our work has been merely preliminary and covered only a small number of species.

The key includes a few species not yet found in the state. Every season seems to differ in the particular species one finds and a number of forms still remain unidentified, but the following list comprises all the species frequent from year to year, at least in the southern part of the state.

The genus has been largely gone over and revised since the publication of the Monograph (Mich. Acad. Rep. 11, 1909), and several additional species have been included and others more fully described and discussed. The recent critical papers by Maire, Romell, Battaille, Ricken, and others in Europe, have thrown much needed light on a number of species.

Key to the Species

(A) Gills unequal, alternately long and short, flesh thick to the margin of the pileus, which is at first incurved and never has striations. (Compactae).
(a) Flesh white, unchangeable.
(b) Gills subdistant; plant entirely whitish; pileus 8-15 cm. 99. *R. delica* Fr.
(bb) Gills close.
(c) Pileus whitish then sooty-gray, 5-7 cm. broad. 102. *R. adusta* Fr.
(cc) Pileus not becoming sooty in age.
(d) Odor strong, alkaline; pileus large, 10-30 cm. broad, whitish then pale rusty-ochraceus. *R. magnifica.* Pk.
(dd) Odor none; pileus 4-8 cm. broad, whitish. 99. *R. decila* var. *brevipes* Pk.
(aa) Flesh changing to reddish or blackish in age or when bruised.
(b) Flesh at length incarnate or rusty-reddish; odor disagreeable when drying. 104. *R. compacta* Frost.
(bb) Flesh at length blackish.
(c) Gills subdistant to distant; flesh at first reddish when bruised, then black. 100. *R. nigricans* Fr.

(cc) Gills close or crowded.
(d) Gills etc. becoming reddish then black; gills crowded. 101. *R. densifolia* Secr.
(dd) Gills etc. becoming bluish-black, not at first red; pileus dry. 103. *R. sordida* Pk.
(AA) Gills mostly equal, sometimes with shorter ones scattered promiscuously.
(a) Gills dichotomously forked throughout; pileus dull pink to purplish when young, later olivaceous, or greenish-umber. 116. *R. variata* Bann.
(aa) Gills forked only at the base, or forking not extensive or lacking.
(b) Spores white in mass.
(*R. aeruginea, R. foetentula, R. rosacea, R. mariae* and *R. subpunctata* have creamy-white spores).
(c) Pileus white.
(d) Taste acrid. 133. *R. albidula* Pk.
(dd) Taste mild.
(e) Pileus viscid, sometimes tinged yellowish; remaining white when dried. 139. *R. albida* Pk.
(ee) Pileus dry, sometimes tinged pink. 133. *R. albella* Pk.
(cc) Pileus some shade of green or dingy greenish-white. [See also (ccc)].
(d) Pileus with a continuous separable pellicle; taste mild. 120. *R. aeruginea* Lindb.
(dd) Pellicle adnate, becoming pulverulent or areolate-cracked; gills close.
(e) Pileus dry, dark green when young, substriate on margin. 105. *R. virescens* Fr.
(ee) Pileus viscid, glabrous on disk, mouldy-white to pale greenish-white, striate on margin. 106. *R. crustosa* Pk.
(ccc) Pileus some shade of red, pink, purple or bluish. [See also (cccc)].
(d) Taste mild.
(e) Gills floccose-crenulate on edge; pileus viscid, shining blood-red; stem tinged red. 141. *R. purpurina* Q. & S.
(ee) Edge of gills not crenulate.
(f) Pileus firm and hard, or compact; pellicle adnate or disappearing in places.
(g) Pileus pruinose-velvety, dark red, or purple-red; stem rosy or dark red; gills at length dingy cream-color. 119. *R. mariae* Pk.
(gg) Pileus not markedly pruinose.
(h) Pileus 5-10 cm. broad.
(i) Pileus pale bluish-purple, at length rosy to white on disk, viscid, stem white. 117. *R. cyanoxantha* Fr. var.
(ii) Pileus pale red, soon dry, unpolished; stem rosy-tinged or white; taste rarely slightly acrid. 108. *R. lepida* Fr.
(hh) Pileus 3-6 cm. broad.
(i) Pileus dull lilac-purplish. *R. lilacea* Quel.
(ii) Pileus incarnate to pale livid pink. 114. *R. vesca* Fr.
(ff) Pileus rather thin, fragile or subfragile.
(g) Pileus usually 2-4 cm. broad, clear pink; in oak woods. 142. *R. uncialis* Pk.
(gg) Pileus 4-6 cm. broad, dark violet-purple or purplish-red, silky-shining, in conifer woods. 143. *R. sericeoniteus* Kauff.
(ggg) Pileus 6-12 cm. broad, bright rose-red with yellowish spots; stem white. 140. *R. subdepallens* Pk.
(dd) Taste very acrid.

(e) Pileus 2-6 cm. broad.
(f) Spore-mass pure white; stem white, fragile.
(g) Pileus uniform rosy-red; gills close to subdistant. 131. *R. fragilis* Fr.
(gg) Pileus rosy-red on margin, disk olivaceous or purplaces. 132. *R. fallax* Cke.
plish and livid; gills subdistant; usually in mossy
(ff) Spore-mass creamy white; stem white or rosy.
(g) Pileus rigid, not striate, soon dry; cuticle adnate, unpolished, red. 115. *R. subpunctata* sp. nov.
(gg) Pileus subfragile; pellicle separable and striate on margin, viscid, shining rosy-red. 134. *R. rosacea* Fr. *R. sanguinea* Fr.
(ee) Pileus 5-10 cm. broad, rarely larger.
(f) Rigid. Pileus dark red, not fading, cuticle adnate, even on margin. 118. *R. atropurpurea* Maire.
(ff) Fragile; pileus rose-red to scarlet.
(g) Taste tardily acrid. 130. *R. rugulosa* Pk.
(gg) Taste quickly acrid.
(h) On sphagnum; in troops. 129. *R. emetica* var. *gregaria.*
(hh) On debris of very rotten wood and on the ground. 129. *R. emetica* Fr.
(cccc) Pileus some shade of brown, yellowish, etc.
(d) Odor aromatic, becoming foetid; pileus very striate.
(c) Pileus 7-12 cm. broad, sordid yellowish-whitish. 111. *R. foetens* Fr.
(cc) Pileus 3-7 cm. broad, pale livid ochraceous; base of stem with rusty-red stains. 110. *R. foetentula* Pk.
(dd) Odor not aromatic.
(e) Pileus 6-12 cm. broad, straw-color to ochraceous-reddish, rigid, not striate. 107. *R. ochraleucoides* sp. nov.
(ee) Pileus 3-6 cm. broad.
(f) Taste acrid; pileus grayish-brown, substriate. 113. *R. sororia* Fr.
(ff) Taste mild.
(g) Pileus yellow or yellowish, at least when young, not ashy under the cuticle.
(h) Pileus 5-8 cm. broad, scarcely striate in age, chrome yellow; stem yellow. *R. flavida* Frost.
(hh) Pileus 3-5 cm. broad, very tuberculate-striate in age, at first sulphur-yellow then dingy yellowish-brown. 109. *R. Pulverulenta* Pk.
(gg) Pileus pale yellowish-brown, ashy under the cuticle, strongly striate. 112. *R. pectinatoides* Pk.
(bb) Spores and gills some shade of ochraceous, yellowish or creamy-yellowish (spore-print necessary).
(c) Stem whitish, changing to ochraceous-brown where bruised or handled; odor disagreeable in age; color of pileus purplish-red, olivaceous, yellowish, etc., very variable, colors mixed. 121. *R. xerampelina* Fr. 122. *R. squalida* Pk.
(cc) Stem not with this peculiarity.
(d) Pileus some shade of red.
(e) Taste acrid; fragile.
(f) Pileus reddish-buff to purplish; spores pale yellow; in swamps. 137. *R. palustris* Pk.
(ff) Pileus rosy-red to scarlet.
(g) Gills straw yellowish to pale ochraceous; margin of pileus even, rather firm. 135. *R. veternosa* Fr.
(gg) Gills deep ochraceous-yellow; margin of pileus striate, gills and pileus fragile. 136. *R. tenuiceps* Kauff.
(ee) Taste mild.

(f) Stem at length ashy or blackish where bruised.
(g) Wound at first reddish then black; pileus dull red, variegated with yellow etc., firm. 126. *R. rubescens* Beards.
(gg) Wound not at first reddish.
(h) In coniferous regions; stem stout.
(i) Pileus 5-12 cm. broad, orange-red. 123. *R. decolorans* Fr.
(ii) Pileus 5-10 cm. broad, crimson-red. 123. *R. decolorans* var. *rubriceps* Kauff.
(hh) In frondose regions; stem not very stout; pileus dark red to blackish on disk. 125. *R. obscura* Rom.
(ff) Stem not becoming ashy.
(g) Pileus 5-10 cm. broad or more.
(h) Plants usually solitary or scattered.
(i) Pileus firm, large, dingy or dull red to purplish, often faded; gills ochraceous from the first. 128. *R. alutacea* Fr.
(ii) Pileus and stem very fragile; colors of pileus mixed varying pink, incarnate, yellowish; spores bright yellow. 145. *R. amygdaloides* sp. nov.
(iii) Pileus firm, blood-red. 127. *R. borealis* Kauff.
(hh) Closely gregarious, sometimes in troops; fragile.
(i) Pileus dull and variable in color, not bright red; gills white at first, then creamy-yellowish to pale ochraceous. 144. *R. integra* Fr. and forms.
(ii) Pileus dark violet-purple to dark red; rather firm; spores ochraceous-buff. *R. ochrophylla* Pk.
(gg) Pileus 2-5 cm. broad or less.
(h) Spores pale yellow or cream color.
(i) Pileus umbonate, very fragile; on sphagnum. 148. *R. sphagnophila* Kauff.
(ii) Pileus not umbonate; stem and gills translucent, honey-yellowish in age; fragile. 147. *R. puellaris* Fr.
(hh) Spores truly ochraceous in mass.
(i) Stem rosy-dusted; pileus rose-red, fragile. 146. *R. roseipes* (Sec.) Bres.
(ii) Stem white; pileus pinkish red, lilac etc., fading to yellowish. 149. *R. chamaeolentina* Fr. 150. *R. abietina*, etc.
(dd) Pileus some shade of yellow.
(e) Flesh of stem cinereous when old.
(f) Pileus orange-red, fading in age. 123. *R. decolorans* Fr.
(ff) Pileus dull yellow (flavus), color not changing, scarcely viscid. 124. *R. flava* Rom.
(ee) Flesh not becoming ashy.
(f) Edge of gills vivid lemon-yellow. *R. aurata* Fr.
(ff) Edge of gills concolor.
(g) Taste mild; pileus 2-6 cm. broad, gills egg-yellow. 151. *R. lutea* Fr.
(gg) Taste tardily acrid; pileus 5-10 cm. broad; gills pale yellow. 138. *R. aurantialutea* Kauff.

COMPACTAE Fr. Flesh thick, compact and firm. Pileus without a separable pellicle, its margin non-striate and at first involute. With entire and short gills alternating regularly. Spores white in mass.

This group is closely related to the Piperites division of the genus Lactarius. Some of the species, e. g. *R. delica,* are very similar to *L. vellerius, L. deceptivus,* etc., when the latter are dried out by the wind or dry weather and then lack the milky juice. The Compactae are a very natural group, easily distinguishable.

99. Russula delica Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1068.
Gillet, Champignons de France, No. 607.
Bresadola, Fung. Trid., Vol. 2, Pl. 201.
Ibid, Fung. mang. e. vel., Pl. 68.
Ricken, Blätterpilze, Pl. 15, Fig. 1.
Patouillard, Tab. Analyt., No. 514.
Peck, N. Y. State Mus. Rep. 54, Pl. 71, Fig. 1-5 (as *R. brevipes* Pk.).
Ibid, N. Y. State Mus. Rep. 43, Pl. 2, Fig. 5-8 (as *R. brevipes* Pk.).

PILEUS 8-15 cm. broad, firm, convex-umbilicate then depressed to infundibuliform, *dull white,* sometimes with rusty-brown stains, *unpolished,* glabrous, pubescent or obscurely tomentose, even, *dry,* margin at first involute not striate. FLESH compact, white or whitish, not changing where bruised. GILLS subdecurrent, narrowed behind, broader in the middle, *subdistant,* or distant, thickish, short and long alternating, few forked, *white or whitish,* edge often distinctly greenish. STEM 2-5 cm. long, 1.5-2 cm. thick, *short,* stout, *solid,* equal or subequal or tapering down, white becoming dingy, *not turning blackish* when bruised, glabrous or subtomentose above, often with a narrow pale-green zone at apex. SPORES globose, 9-10 (rarely 11 or 12) micr., tuberculate, white in mass. TASTE mild to tardily but weakly acrid. ODOR none.

Gregarious, in sandy soil. In maple, birch, oak and coniferous woods throughout the state; most abundant along the Great Lakes in conifer regions. July-October. Common locally.

Var. *brevipes* Pk. (=*R. brevipes* Pk., N. Y. State Mus. Rep. 43, 1890), has been found at New Richmond. The gills are crowded and the pileus is smaller, 4-6 cm. broad. It was found in hard clay soil, through which it pushed with difficulty. It is apparently an ecological variety conditioned by dry weather and hard soil. It is uncommon.

The typical *R. delica* is usually a large plant, simulating *Lactarius vellerius* in size, color, etc. Fries in the Epicrisis says the cap is "shining." This error was omitted in his Monographia but copied again in Hymenenomycetes Europaei. The error has since been repeated by other authors, including Cooke on his plate in the Illustrations. The Michigan plants are exactly like those growing in Sweden, where in some of the specimens the edge of the gills and the apex of the stem were tinged green, as is the case in ours, especially in the plants of the northern part of the state. *R. lactea* Fr. is said to have very broad, distant, free gills and milk-white cap and stem. I have not seen any plants with the glaucous green gills of *R. chloroides* Bres.

100. Russula nigricans Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1015.
Gillet, Champignons de France, No. 625.
Michael, Führer f. Pilzfreunde, Vol. III, No. 75.
Ricken, Blätterpilze, Pl. 15, Fig. 2.
Peck, N. Y. State Mus. Rep. 54, Pl. 71, Fig. 6-9.
Hard, Mushrooms, Fig. 146, p. 184, 1908.

PILEUS 7-15 cm. broad, subrigid, convex then depressed to subinfundibuliform, margin at first incurved then spreading and elevated, often irregularly wavy, at first whitish and clouded with umber, *soon smoky-umber,* subviscid at first, glabrous, even on margin. FLESH compact, white, *changing to reddish* where bruised, *then blackish.* GILLS narrowed or rounded behind, adnexed, *thick* and firm, *subdistant to distant,* sometimes intervenose, short and long alternating, white becoming grayish, reddish at first when bruised. STEM 2-6 cm. long, 1-3 cm. thick, *solid,* hard, stout, glabrous, even or lacunose-depressed in places, white at first, *at length smoky-umber,* reddish then blackish where bruised. SPORES subglobose, 8-10 micr., echinulate, whitish in mass. TASTE mild, sometimes tardily but slightly acrid. ODOR none.

Gregarious or solitary. On the ground in coniferous or frondose woods. Throughout the state, rarely in the southern part, more plentiful in the north. July-September.

This Russula usually persists in ordinary weather without decaying and is then frequently inhabitated by another mushroom,

Nyctalis asterophora, as shown in the illustration. It is usually a rather large, firm plant, distinguished from the following by the subdistant, thick gills. The flesh of all parts when bruised turns first reddish then blackish, but the red stain may not appear in old plants; this is to be expected because of the drying up of the scanty juice which is supposed to cause this phenomenon where it is exposed to the air. Peck, McIlvaine and others have eaten it and consider it fairly good.

101. **Russula densifolia** Secr. (Edible)

Mycographie I, 1833.

Illustrations: Cooke, Ill., Pl. 1017.
Gillet, Champignons de France, No. 608.
Patouillard, Tab. Analyt., No. 319.
Hard, Mushrooms, Figs. 157 and 145, 1908.
Kauffman, Mich. Acad. Sci. Rep. 11, Fig. 1, op. p. 90, 1909.

PILEUS 5-12 cm. broad, somewhat firm, convex then depressed to subinfundibuliform, margin at first incurved then elevated, dull whitish at first, *soon clouded with pale smoky-brown,* without a pellicle, usually *subviscid,* even, pruinose when dry. FLESH compact, thick, grayish-white, pale smoky in age, *changing to reddish* when bruised, *then blackish.* GILLS narrowly adnate to subdecurrent, *rather narrow,* thick, *crowded* then close, alternately long and short, few forked, subvenose, whitish soon dingy grayish, reddish when bruised then black. STEM 5-6 cm. long, 1.5-2.5 cm. thick, stout, equal or tapering downward, rigid, spongy-solid, whitish then cinereous, soon dark ashy within, *turning reddish then blackish where bruised,* obscurely wrinkled, glabrous or subpruinose. SPORES globose, coarsely reticulate, 7-9x6-8 micr., white in mass. STERILE CELLS on edge of gills, hyaline, slender, flexuous, acuminate, 60x3-4 micr., abundant. TASTE slowly acrid in fresh plant. ODOR none.

Gregarious, subcaespitose or solitary. On the ground in frondose woods among fallen leaves. Ann Arbor, Detroit, Palmyra. July-September. Usually rare, but abundant in August, 1912, in oak woods at Ann Arbor.

As pointed out by Peck, the American plant is slightly subviscid on the cap but this character is easily overlooked. The viscidity is slight, even after rains. It comes nearest to *R. adusta,* in size,

natural coloring and gills, but differs in the change which the flesh undergoes when bruised. Authors consider *R. adusta* to have a mild taste and if this is true our plant differs also in this respect. The gills are usually markedly crowded and narrow, while those of *R. nigricans* are broad and subdistant. The latter is more common in coniferous regions, while *R. densifolia* has so far been found in Michigan only in frondose woods. Maire (Bull. Soc. Myc. France, 26, p. 87) states that *R. densifolia* lacks the hair-like sterile cells on the edge of the gills; that they are abundant in *R. nigricans* and less numerous in *R. adusta*. In our specimens of *R. densifolia* they were abundant, which would indicate that this is not a very constant character.

102. Russula adusta Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1051.
Michael, Führer f. Pilzfreunde, Vol. II, No. 64.
Ricken, Blätterpilze, Pl. 15, Fig. 3.

"PILEUS 5-7 cm. broad, convex then depressed or subinfundibuliform, *white or whitish,* becoming brownish or sooty-gray, glabrous, dry, even. FLESH compact, white, *not changing when bruised.* GILLS adnate to subdecurrent, *thin, close,* short and long alternating, narrow, white becoming sordid. STEM 2-5 cm. long, about 1.5 cm. thick, *short, solid,* equal or subequal, glabrous, even, *white then sooty-gray.* SPORES subglobose, slightly echinulate, 6-9 micr., white in mass. Taste *mild. Odor* slight."

Gregarious or solitary. On the ground in mixed woods of northern Michigan. July-September. Infrequent.

The smaller size, unchanging flesh when bruised, and thin close gills characterize it. At first the whole plant is nearly white, but it gradually takes on a grayish or sooty cast. Michael, who gives an excellent figure, says it has a rather strong odor which is almost nauseating. This seems not to have been noticed by others. In Europe, also, it is said to be soon attacked by grubs especially in the stem; as the same insects do not always occur in this country, such facts are only of local interest. It usually hugs the ground closely.

103. Russula sordida Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

Illustrations: N. Y. State Mus. Bull. 105, Pl. 98, Fig. 1-3, 1905. Plate XIV of this Report.

PILEUS 5-12 cm. broad, *dry,* convex-depressed, margin at first incurved, glabrous, even, *dingy white becoming smoky with age.* FLESH whitish, compact, *becoming blackish-brown or bluish-black* when bruised, *without first turning reddish.* GILLS adnate to subdecurrent, rather narrow, *close,* long and short alternating, *white becoming blackish in age,* few forked. STEM 3-5 cm. long, 1-2 cm. thick, short, solid, rigid, equal, whitish becoming black when handled. SPORES globose, 7-8 micr., white in mass. TASTE mild or tardily and slightly acrid. ODOR none.

Gregarious or solitary. On the ground in the hemlock regions of the north, rarely in southern Michigan. July-August. Infrequent.

This differs from the European *R. albonigra* (Kromb.) in its dry pileus. A species has been named by Peck with viscid cap, viz., *R. subsordida;* this is probably identical with *R. albonigra.* Our plant has a dry pileus and differs from *R. nigricans* and *R. densifolia* in the lack of the change to red immediately after bruising. In specimens found near Ann Arbor the gills of the young plants were easily separable from the trama of the pileus; whether this is a constant character I cannot say. Peck found the same to be true in specimens of *R. densifolia.* The stems are said to be often infested with grubs.

104. Russula compacta Frost & Peck (Edible)

N. Y. State Mus. Rep. 32, 1879.

Illustration: Peck, N. Y. State Mus. Bull. 116, Pl. 109, 1907.

PILEUS 5-10 cm. broad, firm, convex then depressed to subinfundibuliform, margin at first incurved, thin, then elevated, *dry, unpolished,* minutely tomentose in age, even, whitish when young, *at length sordid-pale-reddish or rusty-ochraceous* either wholly or in spots. FLESH thick, compact, rather brittle, white, *changing to reddish in age or when wounded.* GILLS narrowly adnate, close, rather *narrow,* alternately short and long, sometimes much forked toward base, sometimes few forked, white at first, then stained

sordid reddish or reddish-brown. STEM 3-6 cm. long, 1.5-3 cm. thick, *stout,* spongy-stuffed, *rather brittle,* equal or tapering down, uneven, white at first becoming reddish or reddish-brown in age or from handling. SPORES subglobose, echinulate, with large oil-globule, 8-10x7-8 micr., white in mass. TASTE mild or slightly and tardily acrid. ODOR *becoming disagreeable* in age or on drying, like that of *R. squalida* Pk.

Gregarious. On the ground in beech and maple woods. New Richmond. August-September. Rare.

This is a very distinct species. The whole plant becomes diffused with the rusty-reddish color which is at first pale incarnate, but becomes more marked as the plant ages. The stem has the consistency of that of *Boletus castaneus* or *B. cyanescens* but the interior becomes cavernous less readily than in those plants. The scanty juice which causes the color change has the same relation to the flesh as that which causes the reddish and then blackish color in *R. nigricans.* The disagreeable odor of the drying plant is quite marked, and is an aid to its identification. It is probably quite rare; it was found only a few times in New York by Peck but has been reported by Van Hook from Indiana. *R. incarnata* Morgan (Cinn. Soc. Nat. Hist., 1883) is probably identical. The edges of the gills are provided with microscopic, subcylindrical, sterile cells. In age the plant becomes quite fragile. Peck's figure is not at all illustrative of the colors.

RIGIDAE. Flesh compact, rather thick. Pileus rigid, provided with an adnate cuticle which often cracks or disappears in parts of the surface, especially on disk, mostly separable only at the margin. Gills usually somewhat forked, and with shorter ones intermingled.

The subgenus differs from the Compactae in that the gills do not alternate regularly as long and short and by the presence of an adnate pellicle; it differs from the Subridgidae and Fragiles, by the more rigid substance of the pileus, the adnate pellicle, the presence of short gills and usually by the forking of some of the gills especially at or near the stem. Most of the species are mild or very slightly acrid.

Section I. Margin of pileus obtuse, cuticle soon dry, at length pulverulent, granular or rimosely-cracked in places. Gills broader anteriorly.

105. Russula virescens Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1039.
Gillet, Champignons de France, No. 639.
Bresadola, Fungh. mang. e. vel., Pl. 69.
Michael, Führer f. Pilzfreunde, Vol. II, No. 62.
Atkinson, Mushrooms, Pl. 36, Fig. 1, 1900.
Marshall, Mushroom Book, Pl. 18, p. 69 (poor).
Gibson, Edible Toadstools and Mushrooms, Pl. 11, p. 126, 1903.
Peck, N. Y. State Mus. Rep. 48, Pl. 31, 1896.
Hard, Mushrooms, Fig. 150, p. 189, 1908.
McIlvaine, Amer. Fungi., Pl. 44, Fig. 6, p. 184, 1900.

PILEUS 5-12 cm. broad, at the very first globose, soon convex and expanded, often somewhat depressed on disk, firm, *dry,* as if velvety, the surface (especially the disk) broken into many floccose or pulverulent *areas or patches, green* or grayish green, the margin *not striate* or rarely so, cuticle scarcely distinguishable or separable. FLESH white. GILLS *white.* rather close, narrowed toward the stem, almost or entirely free, few shorter or forked. STEM 3-7 cm. long, 1-2 cm. thick, white, firm, equal or subequal, solid or spongy. SPORES white, subglobose, 6-8 micr. CYSTIDIA none. No differentiated subhymenium. TASTE *mild.* ODOR none.

Oak and maple or mixed woods, probably throughout the state. Occasional. July and August.

Under this name was included in this country, for a time, a more common form with viscid striate cap which has been segregated by Peck under the name of *R. crustosa.* The two seem to run into each other at times, but Peck distinguishes the pileus of *R. crustosa* "by its smooth, not warty center, its paler color and usually striate margin." The latter is also distinctly viscid when young but this depends considerably on the weather conditions. *R. virescens* might be confused with green specimens of *R. variata* whose surface is sometimes areolate, but the gills of *R. virescens* are not as pure white, are not decurrent nor much forked, and the taste is mild.

Microchemical tests: G. (Flesh and gills slowly bright blue.) F S. (No effect.) S V. (No effect.)

106. Russula crustosa Pk. (Edible)

N. Y. State Mus. Rep. 39, 1886.

Illustration: N. Y. State Mus. Bull. 67, Pl. 84, Fig. 1-7, 1903.

PILEUS 5-12 cm. broad, firm, convex then expanded and depressed in the center, surface cracked except on disk, the *areas crustlike,* sordid cream-color, dirty brownish or ochraceous, usually tinged with olive or green, *viscid* when young or moist, especially on the disk, *striate on margin* when mature. FLESH white. GILLS *dull white,* becoming somewhat dingy cream color in age, rather broad in front, narrowed toward the stem, adnexed or free, *thick, distinct,* not crowded, rather brittle, few forked, few short. STEM 3-6 cm. long, 1-2.5 cm. thick, short, stout, spongy-stuffed, subequal or ventricose, white. SPORES white, subglobose, 8-10 micr. CYSTIDIA rather numerous, extending clear through the subhymenium. *Subhymenium* sharply separated from gill-trama. TASTE *mild.* ODOR none.

Scattered or gregarious. Oak and maple woods in southern Michigan. July to September. Common.

This is near *R. virescens* and is apparently much more common. It seems to be still referred to *R. virescens* by some authors, although in that case the Friesian description will have to be modified to include it.

Michochemical tests: G. (Flesh and gills become deep blue.) S V. (Gills and flesh very slowly tinged blue.) F S. (Cystidia colored brown.)

107. Russula ochraleucoides sp. nov.

Illustration: Plate XV of this Report.

PILEUS 6-12 cm. broad, *large, rigid,* convex, soon expanded-plane, varying *straw-yellow to pale ochraceous,* usually dull ochre to reddish-ochre toward center, pellicle adnate, soon dry, and *pulverulent* or subrimose, *even* on the *obtuse* margin. FLESH *thick,* compact, white, unchanging or slightly sordid in age. GILLS adnexed or free, *rather narrow,* rounded and slightly broader in front, *white* or whitish, close to subdistant, shorter ones intermingled, often forked in posterior part, intervenose. STEM 4-6 cm. long, 1.5-2 cm. thick, short, *rigid,* equal or tapering slightly downward, *white,* glabrous or subpruinose, spongy-solid, even or obscurely

wrinkled. SPORES globose, very minutely rough, 7-9 micr. (incl. apiculus), *white in mass.* CYSTIDIA very few. BASIDIA about 40x9 micr. TASTE tardily and slightly bitterish-acrid or disagreeably bitter. ODOR faintly aromatic or none.

Gregarious. On the ground in open oak-maple woods. Ann Arbor. August. Rare.

Related to *R. virescens* by its rigidity and the nature of the surface of the pileus. The surface is pulverulent, somewhat rimose in age, soft to the touch and under the microscope is seen to be composed of slender, hyaline, erect cystidia-like hairs. A subhymenium is lacking. It has a short, stout stem and relatively much broader cap. It differs from *R. ochraleuca* in size and in the thick flesh of the cap, in that the flesh of the stem does not become ashy when bruised, as well as in the bitter taste and the unpolished pileus. *R. granulosa* Cke. is said to have a granular stem and pileus, and many cystidia in the hymenium according to Massee. It is far from belonging to the Fragiles where Fries placed *R. ochraleuca. R. granulata* Pk. is said to be tubercular-striate on the margin of the cap and is smaller. The gills are often abundantly forked toward the stem.

108. Russula lepida Fr. (non Bres.) (Edible)

Epicrisis, 1836-38.

Illustrations: Fries, Sverig. Swamp., Pl. 59, form minor.
Cooke, Ill., Pl. 1072.
Gillet, Champignons de France, No. 620.
Ricken, Blätterpilze, Pl. 16, Fig. 4.
Hard, Mushrooms, Fig. 149, Pl. 188, 1908. (Doubtful.)
Gibson, Edible Toadstools, etc., Pl. 12, p. 131, 1903. (Doubtful.)
Atkinson, Mushrooms, Pl. 36, Fig. 3, p. 126, 1900. (Doubtful.)

PILEUS 4-10 cm. broad, *rigid,* convex, then expanded-depressed, cuticle adnate and disappearing on disk, *unpolished, soon dry,* rose-red to pale blood-red, *fading,* disk soon pallid or variegated with paler yellowish-reddish hues, sometimes rimulose-cracked or rugulose on disk, margin obtuse, not striate. FLESH compact, *white* or reddish under the cuticle, thick, abruptly thin on margin. GILLS narrowed behind and narrowly adnate or almost free, close, *rather narrow,* broader and rounded in front, *white then whitish* (albus), few shorter, occasionally forked. STEM 4-7 cm. long, 1-2 cm. thick,

equal or slightly tapering downward, *white or tinged rosy-pink,* spongy-stuffed, rather rigid, obscurely wrinkled. SPORES subglobose, 9-10 x 7-8 (incl. apiculus), with oil-drop, rough or partly smooth, *almost pure white in mass.* ODOR none or very slightly disagreeable. TASTE *mild,* sometimes slightly bitterish-subacrid. CYSTIDIA moderately abundant, subcylindrical, 70-75x10-12 micr.

Gregarious or solitary. On the ground in frondose woods. Ann Arbor, Detroit. July-August. Rather rare.

This plant occurs rather rarely in southern Michigan. It differs from the description given by Bresadola (see translation Mich. Acad. Rep. 11, p. 68, 1909) in that the spore-mass is nearly white, not straw color, and the gills are only slightly thickish. I have found specimens only during a few seasons. Peck also reports it uncommon in New York. The margin of the pileus is sometimes slightly viscid and the cuticle slightly separable on the margin. It must not be confused with *R. mariae* whose cap and stem are less rigid and more deeply colored, and which has creamy-yellowish spores and larger cystidia. Our plant sometimes has an entirely rose-red cap, sometimes, especially when older, approaching the colors of *R. decolorans* but paler and duller, subpruinose when dry and variegated with pinkish, yellowish or pale-orange hues becoming white in spots. It is often rigid for a long time.

Section II. Margin of pileus acute or subacute, at first incurved; cuticle *viscid,* slightly separable only on margin, often disappearing on disk or in spots.

109. Russula pulverulenta Pk.

Torr. Bot. Club, Bull. 29, 1902.

Illustration: Plate XVI of this Report.

PILEUS 3-5 cm. broad, rather rigid at first, *then fragile,* rather thin, broadly convex at first, expanded and depressed to subumbilicate, at first even on the margin, at length *distinctly tuberculate-striate,* cuticle adnate, viscid, separable on margin, in very young stage sulphur-yellow, soon ochraleucous, finally *dingy yellowish brown,* surface *dotted* by small, numerous, *pale yellow, somewhat mealy or flocculent scales or granules,* margin at very first incurved-subinrolled. FLESH white, at first firm and tough, finally soft. GILLS narrowly adnate, close, rather narrow, broader toward front, *white,* unchanging, often bifurcate at stem, intervenose. STEM 3-5

cm. long, 1-1.5 cm. thick, subequal or irregularly enlarged, *rigid-fragile,* surface at the very first covered by a sulphur-yellow pulverulence, *at length dotted by sulphur-yellow granules, especially at base,* white beneath, spongy-stuffed, *becoming cavernous.* SPORES globose, echinulate, 6-8 micr. (incl. apiculus), *white in mass.* CYSTIDIA numerous, subhymenium scarcely differentiated. BASIDIA 45x9 micr., 4-spored. TASTE and ODOR slight or somewhat disagreeable.

Gregarious. On lawns, roadsides, or in frondose woods among grass, etc. July-September. Southern Michigan. Not infrequent during a few seasons.

This Russula is closely allied to the preceding section. Its development has been carefully studied. When the caps are 4 mm., or less broad the margin is definitely subinrolled. The texture of the trama is then very firm and tough and the entire surface of both cap and stem is covered, as seen under the microscope, by a differentiated thin layer composed of short, dense, erect yellow hairs or hyphae. These hyphae are continuous at first with the trama but become separated in masses as the pileus and stem enlarge, adhering at length to the surface of the mature pileus and stem as delicate, appressed, pulverulent-flocculose, sulphur-yellow granules. The hymenium contains very numerous cystidia with a dark-brown, granular content, which project into the subhymenium and often connect with similarly colored hyphae which intermingle with the gill-trama. (Lactiferes.) The young cystidia project above the basidia but later are even with them. These brownish cystidia give a brown-dotted appearance to the sides of the gills as seen under low power of the microscope.

Microchemical tests: G. (Flesh and gills become rapidly light blue, then dark blue.) S V. (Gills first turn reddish then slowly blue; flesh scarcely affected.) F S. (Cystidia colored brown.)

This species is easily confused in the old, discolored stage with *R. pectinatoides* and *R. foetentula*, since both have a livid yellowish-brown cap at times when mature, well marked tuberculate striations, and are about the same size. They lack, however, the peculiar yellow granules of *R. pulverulenta.* (For further remarks see Mich. Acad. Rep. 11, p. 77, 1909.)

110. Russula foetentula Pk.

N. Y. State Mus. Bull. 116, 1907.

PILEUS 3-7 cm. broad, soon fragile, at first subhemispherical then convex to plane and depressed, *viscid, livid-ochraceous, russet-tinged,* disk darker and innately granular, long tuberculate-striate. Margin at first incurved. FLESH thin, whitish. GILLS adnexed or nearly free, close, rather narrow, broader in front, thin, whitish, *often spotted or stained reddish.* STEM 2.5-5 cm. long, 6-12 mm. thick, subequal, somewhat firm, spongy-stuffed, soon cavernous, whitish or sordid-white, *stained at the very base by cinnabar-red stains.* SPORES 7-9 x 6-7 micr., echinulate, *creamy-white in mass.* CYSTIDIA moderately abundant. BASIDIA 40-45x9 micr., 4-spored; *subhymenium* scarcely differentiated. OROR none or somewhat like oil of bitter almonds, varying in intensity. TASTE very slightly acrid.

Scattered or gregarious. On the ground in frondose woods. Ann Arbor. Abundant in 1911.

This species has characters intermediate between *R. foetens* and *R. pectinatoides* and is most easily distinguished from both by the reddish stains at the base of the stem; this character was very constant in many individuals during a single season. The odor varies much in intensity and is often lacking. The pileus is sometimes tinged with reddish-yellow but most of our plants had a decided russet color at maturity. Micro-chemical tests as in *R. pulverulenta.*

111. Russula foetens Fr.

Syst. Myc., 1821.

Illustrations: Fries, Svamp. Sverig., Pl. 40.
Cooke, Ill., Pl. 1046.
Gillet, Champignons de France, No. 612.
Michael, Führer f. Pilzfreunde, Vol. I, No. 45.
Ricken, Blätterpilze, Pl. 19, Fig. 4.
Hard, Mushrooms, Fig. 147, p. 185, 1908.
Plate XVII of this Report.

PILEUS 7-12 cm. broad, fleshy, hard then fragile, *subglobose* then expanded and depressed, viscid when moist, thin margin at first incurved, *tuberculate-sulcate* when expanded, yellowish or dingy ochraceous, pellicle adnate. FLESH thin, rigid but fragile, dingy

white. GILLS white, at *first exuding drops of water,* sordid when old or bruised, rather close, adnexed, few forked, interspaces venose, shorter ones present. STEM 4-6 cm. long, 1-2.5 cm. thick, whitish, short, stout, stuffed then cavernous. SPORES *white* in mass, subglobose, 7.5-10 micr. CYSTIDIA numerous; subhymenium narrow, not sharply differentiated. TASTE *acrid.* ODOR *strongly amygdaline, becoming foetid.*

Gregarious. In mixed woods in the north; in oak, maple, etc., in southern Michigan. July, August and September.

The odor of the fresh young plant is like oil of bitter almonds or cherry bark; when old or decaying it becomes quite disagreeable. The margin of the young pileus is strongly incurved. Not edible.

Micro-chemical tests: G. (Flesh and gills quickly light blue, then dark blue.) S V. (Gills slowly deep blue.) F S. (Cystidia colored brown.)

112. Russula pectinatoides Pk.

N. Y. State Mus. Bull. 116, 1907.

Illustrations: Ibid, Pl. 105, Fig. 6-10.

PILEUS 3-7 cm. broad, rather firm, *becoming fragile, thin,* convex, then plano-depressed, viscid when moist, covered by a thin separable pellicle, radiately rugose-striate on the margin, often halfway to the center, or *strongly tubercular-striate,* dingy straw color, brownish, yellowish-brown or umber-brown. FLESH white, thin, becoming fragile, slightly *ashy under the cuticle,* not changing. GILLS whitish, close to subdistant, thin, distinct, equal, moderately broad, broadest in front, narrowed behind, often stained or broken halfway from stem, some forked at base. STEM 2-5 cm. long, .5 to 1 cm. thick, white or dingy, subequal, glabrous, spongy-stuffed *then hollow,* even. SPORES whitish or creamy-white in mass, subglobose, 6-8 micr. diam. TASTE mild or slightly and tardily acrid. ODOR *not noticeable.*

Gregarious. Grassy places, lawns, groves and woods. Throughout the state. July and August.

Cooke's illustrations of *R. pectinata* and *R. consobrina* var. *sororia* remind one very much of this plant. Peck points out that it differs from these by its mild taste, adnate gills and grayish color under the cuticle. It is also close to *R. foetentula,* which sometimes lacks the odor. *R. subfoetens* Smith as known to Romell, also reminded me of this species. The color of *R. pectinatoides,* the

long striations and the medium size are the best recognition marks in the field. It differs, of course, from *R. foetens* by lack of a strong odor. Whether the margin is at first incurved is nowhere noted.

113. Russula sororia Fr.

Epicrisis, 1836-38 (as subspecies of *R. consobrina*).

Illustration: Cooke, Ill., Pl. 1057.

PILEUS 3-6 cm. broad, rather firm, convex then subexpanded, *viscid* when moist, margin substriate when mature, pellicle somewhat separable along margin, *gray*, olivaceous-brown or grayish-brown. FLESH white, unchanged. GILLS narrow, subdistant, distinct, white for a time, then discolored, adnate, shorter ones intermingled, rarely forked, interspaces venose. STEM 2.5-5 cm. long, 1-2 cm. thick, white, not becoming cinereous, short, spongy-stuffed. SPORES *white*. TASTE *acrid*. ODOR none.

Solitary. Woods in southern Michigan. August and September. Rare. This species used to be placed under *R. consobrina*.

114. Russula vesca Fr.-Bres.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1075.
Bresadola, Fungh. mang. e. vel., Pl. 72.
Ibid, Fung. Trid., Pl. 128 (as *R. lilacea* var. *carnicolor*).
Michael, Führer f. Pilzfreunde, Vol. I, No. 41 b.

PILEUS 3-6 cm. broad, fleshy, firm, convex then expanded and depressed in the center, *viscid, soon dry*, more or less rugulose or wrinkled, reddish, *pale livid-pink*, or sordid flesh-red, becoming paler, cuticle thin and disappearing, *not quite reaching the edge of the pileus* so that a narrow white exposed margin results, margin even and spreading. FLESH white. GILLS white, thin, at length *stained* lurid-brownish or rusty, close, moderately narrow, adnate, forked or anastomosing at base. STEM white, obscurely rivulose, *hard* and compact, subequal, solid, 3.5-4.5 cm. long, 1.5 cm. thick, often discolored by yellowish-rusty stains. SPORES *white in mass*, subglobose, minutely echinulate, 7-8 micr. TASTE *mild*. ODOR none. Rare.

Only a few doubtful collections have been made in southern

Michigan. The above description is taken from my notes of the Swedish plant as known to Romell, and agrees mostly with that of Bresadola. Most modern mycologists consider the Friesian "rugulose-reticulate" character of the stem as too uncertain to be practicable. The important characters are: the hard consistency, the wrinkled or veined rarely "cutefracta" surface of the cap, the cuticle not reaching to the margin of the cap, and the gills discolored in spots. The cuticle apparently ceases to grow so that the surface of the expanding pileus may become somewhat areolate cracked and the margin naked.

115. Russula subpunctata sp. nov.

PILEUS 2-5 cm. broad, *rigid,* convex then expanded-plane to depressed, cuticle adnate and scarcely separable on margin, subviscid, soon dry, *pale dull red to rosy-red,* often white-spotted where cuticle disappears, minutely rivulose or subgranular, margin even, acute. FLESH compact, firm, rather thick on disk, abruptly thin on margin. GILLS adnate to subdecurrent, thin, slightly attenuate at both ends, not broad, close to subdistant, whitish *then pale cream-colored,* few short or forked at base, pruinose, intervenose. STEM 2-4 cm. long, 4-10 mm. thick, subequal or tapering down, spongy-stuffed, *becoming cavernous,* white or rosy-tinged, unchanging, attached at times to roots and forming mycorhiza. SPORES subglobose, rough-reticulate, 9-11x7-9 micr. (incl. apiculus), *creamy-white in mass.* CYSTIDIA abundant, subcylindrical, rough, with dark brown granular content, 90-110x8-12 micr. BASIDIA about 65x9 micr. *Subhymenium* markedly differentiated. TASTE *quickly and very acrid.* ODOR none.

Gregarious. On the ground in frondose woods. Ann Arbor. July-August. Infrequent.

The appearance of this Russula is well shown in Patouillard's figure of *R. punctata* Gill. (Tab. Analyt., No. 621) with which it agrees except in its very acrid taste. The gills of our plants have only rarely a red edge. The spore print is cream-colored or almost light yellowish. Dr. McDougal found one group of specimens forming mycorhiza on roots of *Tilia americana.*

Micro-chemical tests: G. (Flesh slowly light blue; gills unaffected.) S. V. (Flesh and gills quickly deep blue.) F. S. (Cystidia colored brown.)

116. Russula variata Banning—Pk. (Edible)

N. Y. State Mus. Bull. 105, 1906.

Illustrations: Ibid, Pl. 101, Fig. 1-5.
Hard, Mushrooms, Fig. 154, p. 194, 1908 (as *R. furcata*).

PILEUS 5-12 cm. broad, fleshy, firm, convex then depressed to subinfundibuliform, viscid, *not striate,* purplish or *deep rose pink when young,* later variegated with olive or dark umber or sometimes *greenish* with only a trace of *purple,* opaque and reticulate-wrinkled under lens, the thin pellicle slightly separable on the thin margin, with a subsilky or dull luster when dry. FLESH white, firm, cheesy, tinged grayish under pellicle. GILLS shining and *persistently white,* adnato-decurrent, thin, *rather crowded,* narrowed at both ends, not broad, *subdichotomously forked,* interspaces venose. STEM 4-7 cm. long, 1-3 cm. thick, white, firm, solid, equal or subequal, sometimes tapering downward, even. SPORES *white in mass,* subglobose, 7-10 micr. TASTE *mild to tardily acrid* or slightly astringent. CYSTIDIA very few and short. *Subhymenium* not clearly differentiated. ODOR none.

Gregarious. Under conifers at Marquette, in deciduous woods about Ann Arbor. July, August and September. Frequent.

Superficially nearest to the descriptions of *R. furcata* Fr. and *R. virescens* Fr. The former species is rare in Europe, and most authors have consigned it to oblivion or consider it a variety of *R. cyanoxantha.* The plants which used to be referred to *R. furcata* in this country, have found a more appropriate resting place in *R. variata.* The figures of *R. cutefracta* Cke. (Cooke, Ill., Pl. 1024 and 1040) show the color of the young and old plants much better than do Peck's figures, and if Cooke's species had pure white spores and white and dichotomously forked gills, they could be considered identical; however, these points are not clear. Peltereaux thinks *R. cutefracta* Cke. occurs in France and has ochraceous spores and that the cracked margin of the cap is a weather effect; this then could not be our species with white spores. When one finds single old plants with much green, it is quite difficult to distinguish them from *R. virescens;* they are to be separated by their dichotomously forked gills which are slightly decurrent and more persistently white, and by the slight acridity. The cuticle is sometimes cracked toward the margin as in *R. virescens,* but its margin is at first incurved while in *R. virescens* it is straight on the stem. Peck says

it has a good flavor after cooking, which destroys the slight acrid taste.

Micro-chemical tests: G. (Flesh and gills quickly deep blue.) S V. (Gills slowly blue; flesh slightly blue-tinged.) F S. (No effect.)

117. Russula cyanoxantha Fr. var. (Edible)

Monographia, 1865.

Illustrations: Michael, Blätterpilze, Vol. II, No. 59.
Gillet, Champignons de France, No. 605.
Cooke, Ill., Pl. 1076 and 1077. (Doubtful.)
Bresadola, Fungh. Mang. e. vel., Pl. 71. (Doubtful.)

PILEUS 5-10 cm. broad, *rigid,* convex then expanded and depressed in the center or subinfundibuliform, *dark bluish-purple or lilac* on margin, *disk dingy white tinged rose-pink,* cuticle thin and adnate, *viscid,* separable on margin, *even,* or substriate only near edge, surface somewhat wrinkled or streaked. FLESH white, compact, purplish or lilac under cuticle. GILLS *white,* a few forked toward base, few shorter, moderately broad, not very distant, narrowed behind, intervenose. STEM 6-9 cm. long, 1-2 cm. thick, *white,* subequal, spongy-stuffed, cortex hard, sometimes cavernous and compressed, glabrous, even or obscurely wrinkled. SPORES *white in mass.* TASTE *mild.* ODOR none.

Scattered or gregarious. Maple and birch, or mixed woods of northern Michigan, oak and maple woods of the southern part. July-August. Not infrequent.

The above description applies to a definite form which occurs in Michigan and is quite constant. It does not agree with the species understood by Romell, Maire and Peltereaux in Europe, whose typical plant has creamy-white gills and spores. Our species approaches *R. azurea* Bres. in color, but that plant is rather fragile and is related to the *R. emetica* group. Michael's figures show the colors of the cap when young and not yet decolorized on the disk. It is more frequent northward and may be distinct from the European plant.

118. **Russula atropurpurea** Maire (ex. Kromb. non Pk.)

Bull. Sco. Myc. de France, Vol. 26, p. 167, 1910.

Illustrations: Cooke, Ill., Pl. 1025 and 1087 (as *R. rubra*).

PILEUS 5-14 cm. broad, rigid, medium to large size, convex then plane, soon depressed, rather firm, viscid, pellicle adnate and scarcely separable on the margin only, scarlet to dark crimson when fresh and young, *becoming darker to purplish when mature or on drying, pruinose,* disk often darker, sometimes blackish-red to livid olivaceus-purple, sometimes yellow spotted, margin even or only slightly striatulate in age. FLESH dark red under the pellicle, white elsewhere, not changing to ashy. GILLS *white,* dingy in age, *rather narrow,* close behind, subdistant in front, adnexed, few short, interspaces venose. STEM 4.7 cm. long, 1-3 cm. thick, subequal, medium stout, white with a dull lustre, *pruinose,* even, spongy-stuffed, apex floccose-punctate. SPORES white in mass, oval, 8-10 micr. diam., strongly echinulate, nucleate, apiculus long and stout. TASTE *acrid.* ODOR none.

Gregarious or solitary. On the ground, on much decayed logs or debris, sometimes at base of white pine or beech trees, in pine-beech woods. New Richmond. Sept. Frequent locally.

Distinguished among the "ruber" group by the mode of color change while maturing, the white gills, spores and stem, and the acrid taste. In wet weather the cap is viscid, on drying its surface is distinctly pruinose. Except for the colors of the pileus it agrees with *R. ruber* Fr. in the sense of Peck. The stem is rarely inclined to ashy in age but not distinctly so. According to Maire's conception the species is quite variable and includes plants whose stem readily turns ashy.

SUBRIGIDAE. Pileus subrigid, rather compact; cuticle soon dry, *pruinose or pruinose-velvety;* margin obtuse. Gills broader in front, equal. Spore-mass never pure white.

This group approaches the preceding by its rather compact and thick pileus, and the following by its equal gills. The pellicle is soon dry and pruinose or pruinose-velvety by which character the species are best recognized. Several aberrant species are, however, included, e. g., *R. xerampelina* with intermixed short gills and *R. mariae* with margin of pileus at first incurved.

119. Russula mariæ Pk. (Edible)

N. Y. State Mus. Rep. 24, 1872.

Illustrations: N. Y. State Mus. Bull. 75, Fig. 1-8, 1904.
Plate XVIII of this Report.

PILEUS 3-9 cm. broad, firm, subhemispherical at first, then broadly convex to plane and depressed, *dry,* subviscid when wet, *pruinose-velvety,* dark crimson, *reddish-purple* or maroon-purple, *even,* substriate only when old, margin at first incurved. FLESH thick, thinner toward margin, compact, becoming softer, white, sometimes reddish under pellicle. GILLS narrowly adnate or almost subdecurrent, *rather narrow,* of nearly uniform width, *white then dingy cream-color,* close to subdistant, equal, bifurcate at base. STEM 3-9 cm. long, 8-15 mm. thick, subequal or tapering downward, firm then fragile, spongy-stuffed, *pruinose, rosy-red to dull purplish-red,* especially in the middle, rarely white except at ends, white within and unchanging. SPORES globose, tuberculate-crystallate, 7.8 micr., *creamy-whitish in mass,* scarcely yellowish-tinged. CYSTIDIA rather abundant, lanceolate, 90-95x12 micr. BASIDIA 36-42 x9 micr. *Subhymenium* of small cells, not sharply limited. TASTE mild or rarely very slightly acrid. ODOR none.

Gregarious. On the ground in frondose woods. Southern Michigan. July-August. Infrequent.

I have examined the type specimens and submitted drawings, photographs and specimens to Peck. His plants average smaller and his figures and descriptions are deceptive as to size as compared with most of the specimens found in Michigan. With us *R. mariæ* is nearly always larger and has much of the appearance of Cooke's figure of *R. expallens* (Ill., Pl. 1029), but that species is said to have a very acrid taste. The pileus varies scarlet-red, reddish-purple, maroon or dark purple. The caps of the purple forms have the appearance of those of *R. queletii, R. purpurea* and *R. drimei* of Cooke's plates; but all of these have a very acrid taste. The red forms agree quite well with Gillet's and Michael's figures of *R. linnaei,* but Romell, Maire, Bresadola and others consider *R. linnaei* as a doubtful species. The stems of *R. mariæ* are nearly always somewhat colored. The pruinosity of the cap and stem is due to minute tufts of purplish or reddish hairs as seen under the microscope. The plant was named by Dr. Peck in honor of his wife Mary. The interpretation of this species in my previous paper (Mich. Acad. Rep. 11, p. 70, 1909) was an error.

120. Russula aeruginea Lindb. (non Fr.) (Edible)

Svampbok, 1902.

Illustrations: Ibid, Fig. 52.
Cooke, Ill., Pl. 1044 (as *R. heterophylla* Fr.). (Doubtful.)
Michael, Führer f. Pilzfreunde, Vol. II (as *R. livida* Pers.).
Ricken, Blätterpilze, Pl. 16, Fig. 2(as *R. graminicolor* Quel.).

PILEUS 5-8 cm. broad, *moderately firm,* then fragile, convex to expanded, subdepressed, *dull greenish, dark green* to smoky-green, paler on margin, pellicle adnate, subviscid when moist, soon dry with a dull luster and *subpulverulent to pruinose-velvety,* slightly separable on margin, even or substriate in age. FLESH thick on disk, thin on margin, white, sometimes cinereous to greenish under pellicle. GILLS narrowly adnate or almost free, close to subdistant, *rather narrow*, slightly broader in front, entire or very few short ones, distinct, white at first *then pale creamy-white,* becoming dingy in age, bifurcate at base, intervenose. STEM 4-5 cm. long, 1 cm. thick, subequal or tapering downward, glabrous, *white,* spongy-stuffed, firm, even. SPORES subglobose, *creamy-white,* 6-9 micr. TASTE *mild.* ODOR none.

Gregarious or solitary. On the ground in coniferous or mixed woods of the Northern Peninsula. Marquette, Sault Ste. Marie. July-September. Infrequent.

This species is considered identical with *R. graminicolor* Quel. by the French mycologists. The "shining-white gills" (candidae) of the Friesian description is probably an error. *R. heterophylla* Fr. is now limited by most writers to a plant with pure white gills and spores and is rare. *R. olivascens* Fr., reported (Mich. Acad. Sci. Rep. 11, p. 76, 1909), has been omitted as it appears too close to this species; the specimens referred to it had a more yellowish tint to the spore-mass.

121. Russula xerampelina Fr. (Suspected)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., 1041 (as *R. olivacea*).
Gillet, Champignons de France, No. 628 (as *R. olivacea*).
Ricken, Blätterpilze, Pl. 18, Fig. 4 (as *R. olivacea*).

PILEUS 5-10 cm. broad, *firm,* convex then plano-depressed, dry or very slightly viscid in wet weather, pellicle hardly separable,

not striate on margin, surface glabrous or subpruinose, purplish-red to purplish-olive, disk olivaceous, variegated. FLESH *compact,* whitish then dingy. GILLS *creamy-white* to creamy-yellowish, then sordid, rather close, adnexed, moderately broad throughout, thickish, often forked, shorter ones usually intermingled, interspaces venose. STEM white or *rosy-tinged,* soon dingy olivaceous-yellowish where handled, 5-7 cm. long, 1.5-2.5 cm. thick, firm, subventricose or equal, spongy-stuffed, even or obscurely wrinkled, *changing* where bruised *to dirty ochraceous-brown.* SPORES creamy-yellowish, globose, echinulate, 9-10 micr. TASTE *mild.* ODOR *disagreeable with age* or when drying.

Scattered. Hemlock and coniferous or mixed woods of the Northern Peninsula. July and August.

This has usually been referred to *R. olivacea* Fr. in this country. In Europe, *R. olivacea* is a very much debated species. Fries' description requires truly yellow gills (luteis), and with this character it has seldom been found. Romell has never seen such a plant in Sweden and unites *R. olivacea* and *R. xerampelina* under the name *R. graveolens.* The series of color forms included under the last name is quite common about Stockholm, and as far as I could see it is the same as our northern Michigan species. I assume, then, that we can drop the name *R. olivacea* from our list of American Russulas, in which case our olive form goes into the present species. Our plant is near *R. squalida* Pk. as the latter is diagnosed in this paper. It differs, however, from that species in the more firm consistency, in the stem being often reddish, and its habitat in coniferous regions. *R. squalida* is soft and flexible in age.

122. Russula squalida Pk. (Suspected)

N. Y. State Mus. Rep. 41, 1888 (as *R. atropurpurea* Pk.).
N. Y. State Mus. Bull. 116, 1907.

Illustration: Kauffman, Mich. Acad. Sci. Rep. 11, 1909.

PILEUS 7-11 cm. broad, convex then plano-depressed, firm, soon subflaccid, margin *even when young,* becoming slightly tubercular-striate in age, the pellicle continuous but rather adnate, not easily separable, subviscid in wet weather, *soon dry* and then *pruinose-velvety,* even, color varying from reddish-purple to pallid and mixed with olivaceous, tan or ochraceous, often shades of all these colors are seen in one cap, opaque and dull, not shining. FLESH white, thick on

disk, rather thin elsewhere, grayish or grayish-purple under the *cuticle.* GILLS white when young, later *creamy-yellow to ochraceous,* subdistant, becoming fragile, moderately broad, broadest toward the front, more or less forked toward base, few shorter ones, interspaces venose. STEM *white, changing to ochraceous if bruised* when fresh and young, when older becoming dirty-brown or ochraceous-brown where handled, equal and subcylindrical, rather long, 5-9 cm. by 1.5 cm. thick; glabrous, spongy-stuffed, obscurely rivulose. SPORES ochraceous to buff, globose, 7.5-10 micr. TASTE *mild.* ODOR *unpleasant,* very characteristic when plants are old or drying.

Solitary or gregarious. Hemlock and maple woods in the north, oak and maple woods in southern Michigan. July, August and September.

This is our early, abundant Russula about Ann Arbor. It occurs in great quantities during July if the weather is favorable and only sparingly later. Once recognized by its odor and changeable flesh, its many color disguises are not as deceptive as they at first seem. The colors run into each other in a rather definite way, so that the general effect to the observer, after he has compared many individuals, is quite characteristic for the species. Hundreds of individuals were examined about Ann Arbor and all had white stems, never red. When old the effect of the whole plant is that of dinginess. Although the above description extends beyond the limits allowed by Peck's description, it is doubtless his species. Originally it included only the purple or dark red forms and was called *R. atropurpurea* Pk. but since this name was pre-empted, he changed it to *R. squalida.* It seems close to the preceding.

123. Russula decolorans Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1079.
Ricken, Blätterpilze, Pl. 17, Fig. 5.

PILEUS 5-12 cm. broad, *often large,* firm, *globose at first* then convex and plano-depressed, *orange red,* usually ochre on disk and dark red on margin, pellicle separable, subviscid, margin even, slightly striate in age. FLESH white, *becoming cinereous* with age or where broken, becoming fragile. GILLS pale yellowish-ochraceous at maturity, white at first, thin, fragile, moderately broad, close, adnexed, forked at base, few short. STEM 5-12 cm. long,

1-2.5 cm. thick, *stout,* long, spongy or solid, wrinkled-rivulose, white, *the flesh becoming cinereous with age or where bruised.* SPORES subglobose, echinulate, pale ochraceous-yellow, 7-9 micr. TASTE *mild.* ODOR none.

Solitary or scattered. In coniferous or mixed woods of northern Michigan. July, August and September. Frequent.

The large size, globose young pileus, orange-red color and the changing flesh easily distinguish it. *R. depallens* Fr. in which the flesh turns ashy has not with certainty been found. It is said to have whitish gills, and the color of the pileus is dirty red to fawn. *R. decolorans* appears to prefer the regions of the pine and fir, both in this country and in Europe.

Var. *rubriceps* Kauff.

Mich. Acad. Sci. Rep. 13, p. 215, 1911.

The shape of the young and old pileus of this variety is well represented in Cooke's figure of *R. decolorans,* Plate 1079. The color of the pileus is, however, *ruber-red* (Sacc. colors) and persistent, changing only in age or on drying as a result of the cinerescent flesh. The pellicle is adnate, scarcely separable except on the margin, vanishing on the disk and sometimes ochraceus-spotted where the pellicle has disappeared. It is firm and the margin is not striate or very slightly so in age. These characters ally it to the Rigidae. It is slightly viscid. FLESH is firm, white, tinged ashy in age, *becoming dark cinereous on the stem where bruised.* The taste is *mild* and when fresh was taken for *R. lepida.* SPORES creamy-white in mass. It is smaller, at least in our specimens, than the type.

On the ground in beech and white pine woods. New Richmond, Allegan County. September. Apparently rare.

124. Russula flava Romell (Edible)

Lönnegren's Nordisk Svampbok, 1895.

Illustration: Mich. Acad. Sci. Rep. 11, p. 55, Fig. 3.

PILEUS 5-8 cm. broad, *rather fragile,* convex, then plano-depressed, *even or slightly striate* in age, dry in dry weather, somewhat viscid when moist, pellicle separable, *dull yellow* (flavus, Sacc.), color hardly fading, but sometimes ashy, discolored in age. FLESH white *becoming cinereous* with age. GILLS white at first, becoming yellowish, broadest towards front, narrowly adnate, close, distinct, becoming slowly gray in age. STEM chalk-white at first,

the flesh becoming ashy, equal or subequal, spongy-stuffed, obscurely reticulate-rivulose, rather fragile, 6-8 cm. long, 1-2 cm. thick. SPORES *yellowish,* globose, echinulate, 8-9 micr. TASTE *mild.* ODOR none.

Solitary or scattered. In coniferous or mixed woods of northern Michigan. July, August and September. Frequent.

This mild, dull or pale yellow, rather large Russula, with flesh, gills and stem becoming ashy when old, is quite easily recognized. This is *R. constans* Karst. which name was pre-empted. It differs from *R. ochraleuca* Fr. in the mild taste and unpolished pileus, etc. Its habit is very similar to that of *R. decolorans,* but it rarely reaches the same size and differs constantly by its yellow cap.

125. Russula obscura Romell (Edible)

PILEUS 4-7 cm. broad, rather pliant, convex then plano-depressed, dull, *dark blood-red,* pileus sometimes blackish on disk, thin, the pellicle continuous and separable, hardly viscid when moist, *subpruinose* when dry, even or slightly striate in age. FLESH whitish, becoming ashy. GILLS white at first, then dingy straw-color, moderately broad, narrowly adnate, close, mostly forked at base, equal, interspaces sometimes venose. STEM white, *becoming ashy or blackish,* rarely tinged red, subequal, 4-6 cm. long, 10-15 mm. thick, spongy-stuffed, rigid, soon soft, obscurely wrinkled. SPORES *pale ochraceous in mass.* TASTE mild. ODOR none.

Gregarious or scattered, in low woods of southern Michigan. July and August.

It is found frequently around Stockholm. The examples pointed out by Romell did not seem to possess such a blackish stem as some of ours. This species does not remind me of *R. decolorans,* being a more slender and smaller plant. It might be confused with *R. nigrescentipes* Pk., but that species is said to have white spores. Romell (Hymen. Lapland, 1911) suggests that a better name for this plant is *R. vinosa* Lindb. since the latter name was used by Lindbladt in his Svampbok prior to the use of *R. obscura.*

126. Russula rubescens Beards. (Edible)

Mycologia, Vol. 6, p. 91, 1914.

Illustrations: Beardslee, Mycologia, Vol. 6, Pl. 121, Fig. 1.
Plate XIX of this Report.

PILEUS 4-10 cm. broad, firm, becoming fragile, convex-plane, *dull-red, varicgated* with yellowish, ochraceous or olivaceous-purplish hues, at first darker, *fading,* pellicle adnate, *dry,* scarcely separable and substriate on the margin, subglabrous, margin acute and at first straight. FLESH whitish, *staining slowly red then black where wounded,* becoming cinereous from age. GILLS narrowly adnate, broader in front, close to subdistant, medium broad, *equal,* rarely forked, white at first *then pale creamy-ochraceous,* intervenose. STEM 3-7 cm. long, 1-2.5 cm. thick, subequal or tapering down, spongy-stuffed, glabrous, even, white, becoming cinereous in age, *changing slowly* to red then blackish where bruised. SPORES globose, palę ochraceous, 7-10 micr. CYSTIDIA few and short, *subhymenium* not differentiated. TASTE *mild.* ODOR none.

Gregarious or scattered. On the ground in frondose woods. Ann Arbor. July-August. Infrequent.

Remarkable among the Subrigidae for the changes which the flesh assumes on bruising. It approaches *R. nigrescentipes* Pk., but that species is said to have a shining red cap and crowded white gills, and the stem turns blackish; no mention is made of any red stains preceding the black and since the change is slow it could scarcely be overlooked. Our species has appeared from season to season but never in abundance. It is a firm plant when fresh, becoming fragile only in age. It is apparently also related to *R. depallens* Fr. but Maire says "nobody knows this, even in Sweden." *R. obscura* Rom. has a velvety-pruinose pileus whose color is rather uniform, and whose flesh is of a different consistency.

Micro-chemical tests: G. (Gills and flesh turn blue.) S V. (Gills and flesh turn bluish very slowly.) F S. (Cystidia colored brown).

As this report was ready for the press there appeared in print the above name applied by Beardslee to a species from Asheville, N. C., which seems identical with ours.

127. Russula borealis Kauff. (Edible)

Mich. Acad. Sci. Rep. 11, p. 69, 1909.

PILEUS 5-9 cm. broad, *firm and rather compact,* convex then plano-depressed, outline broadly elliptical, often with a sinus on one side, *blood-red,* disk darker or color uniform and not fading, pellicle somewhat separable, hardly viscid, margin even or obscurely striate. FLESH white, red under the cuticle, not very thick. GILLS *ochraceous,* subdistant or moderately close, *medium broad,* broader in front, narrowly adnate, rather distinct, edge often reddish anteriorly, equal, a few forked toward base, interspaces venose. STEM white and *tinged red* in places, *firm,* spongy-stuffed, thickened below, 5-7 cm. long, 1.5-2 cm. thick. SPORES deep *ochraceous-yellow* in mass. TASTE *mild,* sometimes slightly and tardily acrid. ODOR none.

Solitary. In mixed woods of hemlock, yellow birch and hard maple, in the Northern Peninsula. Huron Mountains, Marquette and Munising. August.

Russula alutacea is usually larger, stouter, the cap dull or sordid red, and with broader gills. *Russula ochrophylla* occurs in oak woods, has "buff spores, dusted" on yellow gills, and has violaceous-purple or purple-red cap. Peck saw our plant but did not refer it to either species. This species and *R. alutacea* show the futility of using the striations on the margin of the cap as an important character to distinguish the main groups. A true pellicle is present in both and is often quite easily separated especially on the margin, and this with the character of the gills connects them very closely with the Fragiles. *R. linnaei,* which is not well known in Europe, looks like it according to Cooke's figures, but is said to have white gills and spores.

128. Russula alutacea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1096 and 1097.
Gillet, Champignons de France, No. 597.
Berkley, Outlines, Pl. 13, Fig. 8 (reduced in size).
Bresadola, Fungh. mange. e. vel., Pl. 76.
Patouillard, Tab. Analyt., No. 513.
Michael, Führer f. Pilzfreunde, Vol. II, No. 65 (as *Russulina alutacea*).

Atkinson, Mushrooms, Pl. 36, Fig. 2, 1900 (much reduced in size).

Gibson, Edible Toadstools and Mushrooms, Pl. 12, Figs. 2, 4, 6, p. 131, 1903 (much reduced in size).

PILEUS 8-15 cm. broad, large, firm, convex then depressed, with dull colors, dark reddish-purple, sordid red, sometimes mixed with other shades, the reddish color predominating, *with somewhat separable pellicle,* glabrous, somewhat viscid in wet weather, soon dry, *pruinose and subgranulose,* margin even or somewhat short-striate in age. FLESH white, thick. GILLS *ochraceous from the beginning,* deeper ochraceous to tan-colored when mature, *rather broad,* thick, *subdistant,* broader in front, rounded adnexed, of *equal* length. STEM 7-10 cm. long, 3-4 cm. thick, very *firm, stout,* solid, *tinged red* or entirely white, subequal or ventricose, almost even. SPORES ochraceous-yellow to alutaceous, subglobose, 9-11 micr. TASTE *mild.* ODOR none or pleasant.

Usually solitary and rather late. Oak and maple woods of southern Michigan. Not very common. August and September.

As limited above, no bright or shining red forms are admitted from our territory. This species and *R. integra* have been the receptacle for a good many reddish species with ochraceous gills, and even experienced mycologists cannot agree on their identification. I have kept this name for a large, solitary, often late plant, with firm or hard consistency and dull, dark red and purplish cap, with truly ochraceous gills and spores. *R. integra* has cream-colored or at least paler spores and is more fragile and often grows in troops. The descriptions of this and R. *ochrophylla* run close together. Cooke's illustration of *R. alutacea* fits our plants well.

FRAGILES. Pileus thin, fragile, the viscid pellicle continuous and quite separable, margin connivent, not incurved when young, usually strongly striate. The gills are of equal length, broader anteriorly, narrowed behind.

Section I. Taste acrid. Spores white in mass.

129. Russula emetica Fr.

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 21.
Cooke, Ill., Pl. 1030.
Gillet, Champignons de France, No. 610.

Bresadola, Fungh. mang. e. vel., Pl. 68.
Marshall, Mushroom Book, Pl. 17, p. 68, 1905 (reduced).
Gibson, Edible Toadstools and Mushrooms, Pl. 13, p. 139, 1903 (reduced).
Atkinson, Mushrooms, Pl. 36, Fig. 4, 1900 (reduced).
McIlvaine, American Fungi, Pl. 41, Fig. 2, 1900.

PILEUS 5-10 cm. broad, fleshy, soon *fragile,* convex to plano-depressed, *rosy to blood-red,* sometimes faded to white, pellicle separable, *margin strongly tubercular-striate* or even sulcate, viscid and shining. FLESH white, *red under the cuticle.* GILLS *pure white,* subdistant or close, distinct, rather broad, equal, broadest toward front, narrowly adnexed or free, interspaces venose. STEM 4-7 cm. long, 1-2 cm. thick, white or tinged red, subequal, spongy-stuffed, even. SPORES *white in mass,* globose, echinulate, 7.5-10 micr. TASTE *very acrid.* ODOR none.

Scattered or gregarious. On the ground or on debris of very rotten logs in woods. Throughout the state. July to October. Common.

The mycelium has been found to be attached to oak tree roots where it forms mycorrhiza. The very acrid taste gives it a bad reputation and it is avoided by mushroom-eaters. Some think it is harmless when thoroughly cooked. There are variations of habitat. It grows quite constantly on the crumbling remains of wood or logs, where its white strings of mycelium are easily seen; here the gills are close. One form has been found growing in troops; such were found in a tamarack swamp in late October, growing on thick beds of sphagnum. They had developed somewhat differently in this habitat as was to be expected. The stems were white, long and stout, narrower above and obsoletely wrinkled. The gills were subdistant. The taste was sharp but not as excruciating as that of the type. The disk of the pileus was glabrous and very viscid. It was a beautiful plant, apparently appearing late; it might be referred to as var. *gregaria.*

130. Russula rugulosa Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. 72, Fig. 12-18.

PILEUS 5-10 cm. or more broad, thin, *fragile,* convex then plano-depressed, *dark rose-red,* color sometimes thin, *surface* almost entirely *rugulose,* the rugae radiating somewhat, rather viscid, pellicle

separable, margin at length distinctly tubercular-striate. FLESH thin, white, red under the pellicle. GILLS shining white, rather close, narrowly adnate, not very broad, broadest in front, few forked, equal, interspaces venose. STEM white, subequal, unchanged, glabrous, spongy-stuffed, 6-7 cm. long, 1-2 cm. thick. SPORES *white in mass,* globose, echinulate, 8-9 micr. TASTE tardily but very acrid.

In troops. Hemlock and mixed woods on the ground. August and September. Northern Michigan.

Differs from *R. emetica* in that its acrid taste develops slowly, in the uneven and rather dull pileus and in the habit of appearing in troops on the ground. It was formerly referred to *R. emetica,* and is close to it.

131. Russula fragilis Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1091.
Gillet, Champignons de France, No. 614.
Patouillard, Tab. Analyt., No. 622.
Michael, Führer f. Pilzfreunde, No. 43 (var.).
Ricken, Blätterpilze, Pl. 19, Fig. 3.
Hard, Mushrooms, Fig. 172, p. 192, 1908.

PILEUS 2.5-5 cm. broad, *very thin* and fragile, convex then plano-depressed with a thin viscid pellicle, tubercular-striate on the thin margin, glabrous, rather uniform rosy or *pale red,* sometimes faded or bleached to white. FLESH *white under the pellicle,* thin. GILLS white, thin, close, crowded, adnexed, ventricose, moderately broad. STEM 2.3-5 cm. long, .5-1 cm. thick, white, spongy then hollow, equal, fragile. SPORES *white in mass,* subglobose, 8-9 micr. TASTE promptly and *very acrid.* ODOR none.

Scattered. On the ground in woods. Throughout the state. July-August. Infrequent.

This species, as limited here, is only distinguishable from *R. emetica* relatively; it is smaller, color paler, flesh thinner and more fragile and white under the cuticle. Maire says the taste is more quickly acrid on the tongue than *R. emetica,* but not as violent. It grows in somewhat dryer situations. Var. *nivea* is a white plant, otherwise the same. *R. fallax* Cke. used to be considered a variety of it.

132. Russula fallax Cke.

Illustration: Cooke, Ill., Pl. 1059.

PILEUS 3-7 cm. broad, *thin, fragile,* color incarnate or pale rose, the *disk* pale *olivaceous or livid,* sometimes darker or purplish, soon plane or slightly depressed on disk, quite viscid, margin striate and becoming elevated, surface faintly rugulose under lens. FLESH white. GILLS white, unchanged, subdistant, attached by a point, *narrow,* edge even. STEM 3-4 cm. long, 6-10 cm. thick, pure white, cylindrical or compressed, equal, spongy-stuffed, soon hollow, longitudinally-wrinkled under a lens. SPORES *white in mass,* subglobose, 7.5 micr. TASTE promptly and very acrid.

Solitary or gregarious. In sphagnum bogs, low mossy ground in woods, etc., often attached to sphagnum. Distributed throughout the state. Not rare. July, August and September.

This species differs in two important particulars from *R. fragilis.* The gills are subdistant and the pileus is livid or olivaceous in the center. It is very characteristic of the sphagnum flora of the state. It has often been referred to *R. fragilis* as a variety. The pileus is not as lilac as shown in Cooke's figure.

133. Russula albidula Pk.

Torr. Bot. Club, Bull. 25, 1898.

PILEUS 2.5-5 cm. broad, *white,* broadly convex, glabrous, the pellicle *viscid* and separable when fresh, the margin even. FLESH white, subfragile. GILLS white, rather crowded, adnexed, not broad, *of equal length,* some basifurcate, interspaces venose. STEM 2.5-4 cm. long, 8-12 mm. thick, white, equal, spongy-stuffed, even. SPORES white in mass, subglobose, 7-10 micr. TASTE acrid. ODOR none.

Solitary. In oak woods. Ann Arbor. July and August.

In dried specimens the pileus and gills are ochraceous to yellowish, and stem whitish. The taste and viscidity seem to be the only marked differences between this species and the other two white Russulas of Peck, *R. albida* and *R. albella.* All three are rather fragile, while *R. lactea* is a compact firm plant with thick, broad, distant gills. There is a white variety of *R. emetica* which is very acrid and fragile and whose striations on the margin of the cap are like those of that species.

Section II. Taste acrid. Spore-mass cream-color, yellowish, ochraceous to alutaceous.

134. Russula sanguinea Fr. (*R. rosacea* Fr.)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1020 (as *R. rosea*).
Michael, Führer f. Pilzfreunde, Vol. II (as *R. rosacea*).

PILEUS 3-6 cm. broad, rather firm at first, *subfragile,* convex-plane or depressed, *rosy-red, viscid,* margin acute and thin, pellicle subadnate, easily separable on margin and tubercular-striate. FLESH rather thin, white, red under the pellicle. GILLS slightly adnate, close to subdistant, *equal,* not broad, *creamy-white.* STEM 4-6 cm. long, subequal or tapering down, often eccentric, *white or tinged rosy-red,* spongy-stuffed then cavernous, rather fragile, glabrous, even. SPORES *creamy-white in mass.* TASTE tardily but truly acrid.

Gregarious. On the ground among grass in frondose woods. Ann Arbor. September-October. Infrequent.

The plants referred here are *R. rosacea* in the sense of Romell, and *R. sanguinea* according to most of the modern French mycologists. They are distinguished by the cream color of the spores and gills. The gills are not decurrent as they are supposed to be in *R. rosacea,* but the stem is often eccentric as that species is described by Fries. Bresadola, Maire, etc., conceive *R. rosacea* Fr. as a plant with pure white gills and spores. Our plant agrees with a species, common around Stockholm, whose gills are usually creamy-white. It was placed by Fries among the rigid forms but is almost too fragile. It is not large and except for the color of the spores small forms might be mistaken for *R. fragilis.*

135. Russula veternosa Fr.

Epicrisis, 1836-38.

Illustrations: Bresadola, Fungh. mang. e. vel., Pl. 75.
Cooke, Ill., Pl. 1033.

PILEUS 5-7.5 cm. broad, convex then expanded, with a somewhat separable pellicle, *indistinctly striate* on the margin, deep rose-red (like *R. emetica*), viscid when moist. FLESH white, red under the cuticle. GILLS white at first, *then straw-color or pale ochraceous.*

narrow, adnate, close, broader in front, equal or few shorter, few forked, interspaces venose. STEM white, *never red,* equal or subequal, spongy-stuffed, somewhat slender, fragile, hollow, even, 1.5 cm. long, 1-1.5 cm. thick. SPORES pale *yellowish-ochraceous,* subglobose, echinulate, 8-9 micr. TASTE *very acrid.* ODOR none.

Scattered or gregarious. Oak and maple woods of southern Michigan. July and August.

This represents a group of red Russulas with acrid taste and gills varying pale ochraceous or somewhat yellowish in the different forms. I have limited the name to those with white stem and a rather firm and hardly striate pileus, although it may include several forms of which only the spore-color has so far been a distinguishable character. The separable, viscid, distinct pellicle and rather fragile stem, relates it to the Fragiles. From *R. tenuiceps* it is separated by the less deep ochraceous spores and gills, the firmer consistency of pileus and gills, and the uniform red color and even margin of the pileus.

136. Russula tenuiceps Kauff.

Mich. Acad. Sci. Rep. 11, p. 81, 1909.

Illustration: Plate XX of this Report.

PILEUS 7-12 cm. broad, thin, fragile, convex to expanded, the somewhat viscid pellicle easily separable, margin at first connivent, *striate,* deep rosy-red or blood-red, sometimes white, spotted or tinged with orange blotches, sometimes uniform red, with or without minute rugae. FLESH white, red beneath the cuticle, *very fragile at maturity.* GILLS white, then yellow-ochraceous, *crowded,* narrow, *fragile,* narrowly adnate to free, few forked, interspaces venose, equal. STEM fragile, white or rosy-tinged, spongy-stuffed, subequal or ventricose, obscurely rivulose, white within and unchanged, 5-9 cm. long, 2-2.5 cm. thick. SPORES *yellow-ochraceous,* subglobose, 6-8 micr., echinulate. TASTE acrid, sometimes tardily but very acrid. ODOR not marked.

Gregarious. Mixed woods at Marquette; in oak and maple woods at Ann Arbor. July and August. Rather frequent.

As in *R. veternosa,* it is probable that several forms are represented here. The red Russulas are very troublesome, and we seem to have a considerable number of forms with acrid taste and yellowish to deep ochraceous gills, which cannot be easily kept separate. All efforts to refer them to old species like *R. sardonia, R. rugulosa,*

R. rosacea, etc., failed repeatedly; the fragile flesh and ochraceous, almost alutaceous gills are too distinctive. The maturing of the spores is sometimes slow and care must be taken to get a good spore print in these red species. All the collections which I have referred here showed red on some or all of the stems of each collection. Their edibility was not tested.

137. Russula palustris Pk.

N. Y. State Mus. Rep. 53, 1900.

PILEUS 4-7.5 cm. broad, *fragile,* subglobose or hemispheric, then convex or nearly plane, viscid, pellicle separable, obscurely tubercular-striate on margin, *reddish*-buff or purplish-red especially on disk, glabrous. FLESH white, thin, tinged with the color of the pileus under the pellicle. GILLS narrowed behind, broader in front, close to subdistant, entire, *whitish then yellowish,* intervenose. STEM 3-7 cm. long, 6-12 mm. thick, equal, glabrous, spongy-stuffed then hollow, fragile, white or tinged red. SPORES subglobose, *pale yellow in mass,* 7.5-10 micr. TASTE *tardily acrid.*

Gregarious or scattered. In low woods or swamps. Marquette, New Richmond, Ann Arbor. August-September. Infrequent.

The pileus is sometimes faintly glaucous.

138. Russula aurantialutea Kauff.

Mich. Acad. Sci. Rep. 11, p. 81, 1909.

PILEUS 5-10 cm. broad, *thin,* fragile, convex then plano-depressed, *yellow* (citron to luteus), *or with orange shades* intermingled, especially on the margin, slightly tubercular-striate, pellicle viscid, shining and somewhat separable for some distance. FLESH *white,* thin toward the margin, *unchanged with age.* GILLS *pale yellow*, close, or subdistant at the outer extremity, equal or a few shorter, narrowly adnate, seceding with age, broadest toward front, often forked at the base, rarely elsewhere, interspaces venose. STEM 4-8 cm. long, 1.5-2 cm. thick, white, flesh concolor and unchanged, subequal, glabrous, even, spongy-stuffed. SPORES *ochraceous-yellow,* subglobose, 8-9 micr. TASTE acrid in all its parts, often very acrid. ODOR not noticeable.

Solitary or scattered. On debris or forest mould in hemlock or mixed woods of northern Michigan, in deciduous woods in the southern part of the state. July, August and September. Earlier in southern Michigan. Infrequent.

R. ochraleuca Fr. differs in having white to pallid gills and spores, and a cinerescent stem; *R. granulosa* Cke. has white gills and spores and a granular cap and stem; *R. fellea* Fr. has ochraceous or straw-yellow flesh and the more firm pileus is either straw or gilvous color, and its gills exude watery drops; *R. claroflava* Grove has a cinerescent stem and its gills are white then lemon yellow with an ochre tinge; *R. ochracea* Fr. has a mild taste, and the flesh of the cap, gills and stem is ochraceous; *R. simillima* Pk. has white spores and a pale ochraceous pileus and stem; and *R. decolorans* Fr. has cinerescent flesh and is stouter. Our species could be made on ecological variety of almost any of the above species, depending on the guess of the author who so interpreted it.

Section III. Taste mild. Spore-mass white.

139. Russula albida Pk.

N. Y. State Mus. Bull. 2, 1887 (*R. albida*).
N. Y. State Mus. Rep. 50, 1897 (*R. albella*).

Illustration: N. Y. State Mus. Bull. 105, Pl. 96 (*R. albida*).

PILEUS 3-6 cm. broad, *thin, fragile,* broadly convex to plane, slightly depressed in the center, white or whitish, even or slightly striate on the margin, not shining. FLESH white, fragile. GILLS white or whitish, thin, moderately close, entire, equal, not broad, broadest in front, rarely forked at base, adnate or subdecurrent. STEM 2.5-6 cm. long, white, subequal, glabrous, spongy-stuffed or solid. SPORES about 8 micr. diam., *white.* TASTE mild or *slightly bitterish.*

Solitary. Hemlock or mixed woods in the Northern Peninsula. July and August.

Peck's description of both *R. albida* and *R. albella* differs in minor particulars from our plants. The pileus of *R. albida* has a viscid, separable pellicle, while that of *R. albella* is dry. *R. albida* is said to have a "slightly bitterish or unpleasant taste," while our plants were sometimes bitterish, sometimes tardily and slightly acrid. *R. albida* is described with a stuffed or hollow stem; in one of my collections the stem was solid, in another it was spongy-stuffed. It is worth noting whether the spore prints are pure white or with yellow tinge; some of Peck's specimens of *R. albida* had spores with a faint yellowish tinge. In my specimens the whole plant is ochraceous when dried; specimens seen at the N. Y. Botan-

ical Gardens were white when dry. As these species occur so seldom and far apart, it is difficult to obtain exact data with regard to their characters. *R. anomala* Pk. and *R. albidula* differ in the acrid taste.

140. Russula subdepallens Pk. (Edible)

Torr. Bot. Club Bull., Vol. 23, 1896.

PILEUS 5-14 cm. broad, *fragile,* convex then plane and depressed, margin elevated in age, *bright rosy-red,* shading into yellowish blotches as if the red color were put over the yellow, disk paler in old specimens, disk dark-red in very young plants, with a thin, separable, viscid pellicle, *tubercular-striate* on margin, obscurely wrinkled elsewhere. FLESH white, rosy under the cuticle, becoming slightly cinereous, *very fragile.* GILLS *white,* broad in front, narrowed behind, adnate, subdistant, few forked, interspaces venose. STEM white, spongy-stuffed, rather stout, 4-10 cm. long, 1-3 cm. thick, subequal. SPORES *white in mass,* globose, echinulate, 7.5-8 micr. TASTE mild. ODOR none.

Gregarious. In woods of maple, yellow birch and hemlock of northern Michigan. August.

Found in a number of places in considerable abundance. The fragile character, especially of the gills, is very marked and the mild taste, white gills and red cap help to distinguish it. The flesh does not turn so strongly ashy as in Peck's plants, and this character did not seem to be always noticeable. It is distinguished from *R. purpurina,* the brilliant-red Russula, by its gregarious habit, large size and less viscid cap; also the gills are not crenulate. Our specimens had the stature and appearance of *R. rugulosa* and *R. emetica* var. *gregaria.* Peck's plants were found in Pennsylvania by Dr. Herbst, and reported but once; the species is not included in Peck's New York monograph. Our plant has so far been limited to the north.

141. Russula purpurina Quel. & Schultz (Edible)

Hedwigia, 1885.

Illustrations: McIlvaine, American Fungi, Pl. 45 [a. p.] 188, 1900.
Plate XXI of this Report.

PILEUS 3-7 cm. broad, fragile, *viscid,* usually very viscid, subglobose then expanded and slightly depressed at the disk, *brilliant rosy-red* to blood-red or even darker, pellicle somewhat separable,

margin thin but *not striate* except when fully expanded, surface when dry as if with a bloom. FLESH white, red under the cuticle, thin, fragile, unchangeable. GILLS *white,* later dingy-white or "yellowish," medium close to subdistant, adnexed, not broad, broadest in front, mostly equal, few or none forked, interspaces sometimes venose, *edge floccose-crenulate.* STEM rather long, 5-8 cm., 8-12 mm. thick, sprinkled rosy-pink, equal or subequal, spongy-stuffed, fragile but rather soft. SPORES *white in mass,* globose, 8-10 micr. TASTE mild. ODOR none.

Solitary or scattered. In mixed or maple-birch woods of the Northern Peninsula. Infrequent. August and September.

Distinguished by its brilliant red, viscid cap, small to medium size, mild taste and white crenulate gills and spores. Peck also notes the floccose-crenulate edge of the gills, which is due to cystidia. *R. uncialis, R. sericeonitens* and *R. subdepallens* are the only others of the Fragiles group with mild taste, red cap and white spores. From *R. unciales* it differs by the deep color, character of gills and habitat. *R. sericeonitens* is hardly viscid and becomes silky-shining; it has a different stature and color. Maire points out that *R. punctata* Gill. and *R. pseudointegra* A. & G. have gills with a floccose-crenulate edge.

142. Russula uncialis Pk. (Edible)

N. Y. State Mus. Bull. 2, 1887.

Illustrations: Peck, N. Y. State Mus. Bull. 116, Pl. 107, 1907.

PILEUS 2-5 cm. *broad,* thin, rather fragile, convex then expanded-depressed, *pink or bright flesh-color, unicolorous,* the rather adnate pellicle slightly separable, slightly viscid when moist, pruinose and pulverulent when dry, margin not striate till old. FLESH white, pink under the pellicle, unchanged. GILLS pure *white,* hardly changed, *rather broad,* broadest in front, narrowed behind and adnate, subdistant or moderately close, distinct, entire on edge, few forked, interspaces venose. STEM white, rarely tinged pink, rather short, 1-3.5 cm. long, 4-10 mm. thick, spongy-stuffed, equal, glabrous. SPORES *white in mass,* subglobose, echinulate, 7-8 micr. TASTE mild. ODOR none.

Gregarious. In oak woods of southern Michigan. July and August. Quite common in places.

The persistently white gills and spores, the mild taste, uniform pink color and size, distinguishes this Russula. It is sometimes more than an inch in width.

143. Russula sericeo-nitens Kauff. (Edible)

Mich. Acad. Sci. Rep. 11, p. 84, 1909.

PILEUS 4-6 cm. broad, very *regular*, rather thin, convex then plano-depressed, *dark violet-purple* or dark blood-red tinted purplish, disk sometimes livid-blackish, the *separable pellicle* slightly viscid when moist, not striate or substriate in age, surface with a silky sheen. FLESH white, thin on margin, unchanged, purplish under the pellicle. GILLS *white*, subdistant or medium close, becoming flaccid, moderately broad, broad in front, narrowed behind, dry, equal, few forked near base, interspaces venose. STEM white, equal or thickened at apex, spongy within, unchanged, glabrous, even or obscurely rivulose, 3-5.5 cm. long, 1 cm. thick. SPORES *white in mass*, globose, echinulate, 6-7.5 micr. TASTE *mild*. ODOR none.

Usually solitary. In mixed woods of hemlock, maple and yellow birch in northern Michigan. July and August. Not uncommon.

Its thin pileus is *flexible* at maturity. The *silky sheen* and regular pileus are quite characteristic. The cap has the color of Cooke's figures of *R. queletii* Fr., *R. drimeia* Cke. and *R. purpurea* Gill. These three, including *R. expallens* Gill., have been placed together by some modern authors as one species, characterized by "a pruinose, violaceous, decolorate stem, and very sharp taste." The taste is said to be so peppery that even when the color is washed out by rains they can be recognized by this character. All of the four are violet or reddish on the stem. Our specimens all had a white stem and an impeachable mild taste.

Section IV. Taste mild; spore-mass cream-white, yellowish or ochraceous.

144. Russula integra Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1093 and 1094.

PILEUS 5-10 cm. broad, firm, *soon fragile*, discoid, convex or campanulate then plano-depressed covered with *a viscid separable pellicle*, thin on the margin, at length *coarsely tubercular-striate*, variable as to color in different plants, *colors dingy or sordid*, from buff through to reddish-brown and dark dull red, *fading*. FLESH white, not changing. GILLS *white at first*, then creamy-yellow

to buff-ochraceous, not strongly ochre, *broad, distinct,* equal, nearly free. STEM white, unchanged, *never red,* soon quite fragile, conic or short-clavate at first, then subequal or ventricose, spongy-stuffed, even. SPORES *creamy-yellow to pale ochraceous.* TASTE mild. ODOR none.

Gregarious. In woods, probably throughout the state. Ann Arbor. July and August. Not common.

This species is a sort of clearing house for various colored Russulas with broad, pale ochraceous gills and mild taste, especially reddish forms. I have given Fries' description above, supplemented for the most part from notes of my own collections about Stockholm. Romell describes the cap as "brown, blackish-brown, reddish-brown, dark red, violaceous, yellow or greenish, either unicolorous or with whitish or yellowish spots." I saw only the dirty reddish-brown, dark dull red and sordid-buff forms at Stockholm. In favorable weather or situations they occur in troops and seem very common in Sweden. Peck says they are rare in New York state. The European mycologists do not agree among themselves as to this species, but there seems to be a fair unanimity that the "dusting" of the gills by the spores is too deceptive for practical use in identification. *R. integra* is to be separated from *R. alutacea* by its gills being white at first, by the white fragile stem, the paler spores and more striate pileus; under certain conditions these two species are hardly distinguishable.

The two plates of Cooke referred to, give the best idea of the species as here limited. The figures of this species with bright red caps, shown by various authors, illustrate segregated species for the most part. Maire (Soc. Myc. Bull. 26, 1910) has named one form, *R. romellii,* and considers another to be *R. melliolens* Quel. As Fries pointed out long ago, it is easy to separate new species from the mass of plants usually referred here, and the more exact method with the microscope will doubtless produce many more. I have found this species rarely but then in quantity, as they usually cover quite an area from the same mycelium.

145. Russula amygdaloides sp. nov. (Edible)

(See under *R. barlae* Quel., Mich. Acad. Sci. Rep. 13, p. 221, 1911.)

PILEUS 4-8 cm. broad, thin, medium size, ovate at first with straight margin, then convex-plane or depressed, very viscid, *fragile, pale rosy-flesh color tinged with yellow,* sometimes *peach color,* sometimes dull citron-yellow, varying in color from young to old,

pellicle continuous and entirely separable, *margin becoming* strongly tuberculate-striate. FLESH thin, white, not changing color, soft. GILLS *bright ochraceous-yellow* (flavus, Sacc.), white at first, *rather narrow,* broadest in front, narrowed and adnexed behind, subdistant at maturity, dusted by the spores. STEM 4-8 cm. long, 1-2 cm. thick, *subequal to ventricose, soft* and *fragile,* loosely stuffed then cavernous (but not from grubs), white, rarely tinged with delicate pink, slightly wrinkled, subglabrous. SPORES subglobose, 7-9 micr., echinulate, nucleate, bright ochre-yellow in mass. TASTE mild. ODOR none. CYSTIDIA very few. *Subhymenium narrow,* sharply differentiated from gill-trama.

Solitary or scattered. In mixed woods of hemlock and beech, among beds of white pine needles at New Richmond; among grass, etc., in oak woods at Ann Arbor. July-October. Frequent.

This very fragile Russula is known from the other members of the "Fragiles" group by its medium size, bright yellow-ochraceous spores and gills, the hollow, often subventricose stem, the mild taste and the pinkish-yellow to peach-colored pileus. The stem is sometimes enlarged at the apex, sometimes at the base, always fragile. Very few of our Russulas have such bright-colored spores and gills. The color of the cap varies rather rarely to a deeper red on the one hand or to ochraceous-tan and straw-color on the other. The flesh does not change on bruising, and the odor is not noticeable even in age. It is very different from *R. integra* Fr. It approaches *R. nitida* and is no doubt the plant usually referred to that species in this country. It differs in the lack of the nauseous, disagreeable odor which is known to be constant in *R. nitida.* I formerly referred it to *R. barlae* Quel. which, however, is described as compact and firm. *R. aurata* Fr. has gills with a chrome-yellow edge.

Micro-chemical tests: G. (Flesh turns blue quickly; gills become greenish-blue.) S V. (Flesh and gills slowly pinkish then blue.) F S. (Cystidia colored brown.)

146. Russula roseipes Secr.—Bres. (Edible)

Fung. Trid., Vol. I, 1881.

Illustration: Ibid, Pl. 40.

PILEUS 2.5-5 cm. broad, *thin, fragile,* convex then plano-depressed, with a viscid, separable pellicle, margin tubercular-striate when mature, soon dry, *rosy-red or flesh-red,* disk tending to ochre-yellowish. FLESH white, thin, unchanged. GILLS soon truly

ochraceous, subdistant, mostly equal, broadest in front, ventricose, narrowly adnate or almost free, few forked, interspaces venose. STEM white and *rosy-sprinkled,* stuffed then cavernous, equal or tapering upward, even, 2.5-5 cm. long, 5-12 mm. thick. SPORES *ochraceous,* globose, echinulate, 8-10 micr. TASTE mild. ODOR none or pleasant.

Solitary or scattered. In mixed woods, but usually under conifers. Only found in the northern part of the state. July and August.

A middle-sized to small plant, fragile, and with a rosy mealiness on the stem. This last is quite characteristic of the species. It occurs under spruces and balsams in moist places. It is quite distinct from *R. puellaris* Fr. to which Fries, who had never seen Secretan's plant, referred it as a variety. *R. purpurina* also has a rosy-sprinkled stem, but is very viscid and more brilliant shining red on the cap. Peck (Rep. 51, p. 307) says the stem is not rosy-sprinkled in his plants, but that the color resides in the stem; he does not seem to have had the typical plant.

147. Russula puellaris Fr.

Monographia, 1863.

Illustrations: Cooke, Ill., Pl. 1065.
Bresadola, Fung. Trid., Vol. I, Pl. 64.
Ricken, Blätterpilze, Pl. 17, Fig. 2.

PILEUS 2-4 cm. broad, *very thin,* convex then plano-depressed, viscid, *tubercular-striate* on the margin, livid-purplish or livid-brownish, then sometimes yellowish. FLESH white at first, soon watery subtranslucent, fragile. GILLS pallid white to pale yellow, watery honey-colored in age, equal, thin, subventricose, narrowed behind and adnexed, interspaces venose. STEM whitish, then *watery honey-colored toward base,* spongy-stuffed, soon cavernous, soft and fragile, subequal or subclavate at base, 4-5 cm. long, 7-10 mm. thick. SPORES subglobose, echinulate, *pale yellow,* 6-8 micr. TASTE mild or slightly acrid. ODOR none.

Found in low, moist places in conifer or mixed woods of Europe. It has not yet been reported from Michigan with certainty. I have given Bresadola's description as that of a typical plant, which is verified by my notes of the Stockholm plants. I have not seen the typical Swedish plant in this country, and Peck's specimens were evidently not typical as he says no yellowish stains occur in the stem. The stem soon becomes soft and then develops this charac-

teristic, translucent, light-yellowish color. Several varieties occur in Michigan differing mainly from the above description in the red caps and non-lutescent stems; these are referred here for the present.

148. Russula sphagnophila Kauff.

Mich. Acad. Sci. Rep. 11, p. 86, 1909.

PILEUS 2-4.5 cm. broad, *very fragile,* convex, *umbonate,* margin at length elevated and disk depressed and purplish-red or rosy-red, the space between the umbo and the margin pale olive-brown, covered by a viscous pellicle, glabrous, margin slightly striate. FLESH reddish under the cuticle and under the surface of the stem fragile. GILLS white then pale ochraceous, narrow, adnato-decurrent, rather close, narrowed toward both ends, few forked here and there. STEM *rosy-colored,* usually ventricose or irregularly swollen, spongy-stuffed *then cavernous,* very fragile, rivulose-uneven, 4-5 cm. long, 7-12 mm. thick. SPORES cream-color, globose, echinulate, 6-7 micr. TASTE *mild.*

Scattered. On sphagnum, in swamps. Cold Spring Harbor. August and September. Rare.

Whole plant very fragile, always with an umbo, subpellucid and rosy stem, and pale gills. The only other Russula with an umbo, known to me, is *R. caerulea* Pers. which differs in color and habitat. The red color rubs off on paper when moist. In some points it is near *R. roseipes,* in others it is nearest *R. puellaris,* and might perhaps be referred to the latter as a variety but without settling anything as to its origin.

149. Russula chamæleontina Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1908.
Gillet, Champignons de France, No. 600.
Ricken, Blätterpilze, Pl. 18, Fig. 2.

PILEUS 2-5 cm. broad, *rather small,* fragile, thin, plano-depressed, with a viscid separable pellicle, margin even at first then striatulate, *color varying for different pilei,* mostly some shade of red, purple, etc., fading to yellowish especially on disk. FLESH white, thin. GILLS thin, crowded or close, adnexed or almost free, equal, rather broad, sometimes almost narrow, few forked, interspaces venose,

ochraceous or ochraceous-yellow. STEM 2-5 cm. long, 4-6 mm. thick, white, spongy-stuffed then hollow, *slender,* equal or subequal to subventricose, sometimes subclavate, even or obscurely rivulose. SPORES *ochraceous.* TASTE mild. ODOR none.

Scattered or gregarious. In coniferous or mixed woods. So far reported only from northern Michigan.

Like *R. integra* this has to be considered at present a composite species, from which several species have, from time to time, been segregated. According to von Post, a pupil of Fries, the master himself included many forms which do not fit into his own description; and Romell follows the Swedish tradition and refers to *R. chamaeleontina* all small forms with mild taste and ochraceous gills not otherwise accounted for. "No subacrid forms are included" writes Romell. Specimens with the caps a uniform red, rose colored, purplish, lilac, etc., and accompanied with a yellowish tint, are always included; sometimes also, whitish, faded forms must be placed here.

150. Russula abietina Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. 72, Fig. 1-11.

"PILEUS 1-2.5 cm. broad, thin, fragile, convex becoming plane or slightly depressed in the center, covered with a viscid, separable pellicle, tubercular-striate on the thin margin, *variable in color,* purplish, greenish-purple or olive-green with a brown or blackish center, or sometimes purplish with a greenish center. FLESH white. GILLS narrowed toward the stem, subdistant, equal, rounded behind and nearly free, ventricose, whitish becoming *pale yellow.* STEM 1-2.5 cm. long, equal or tapering upward, stuffed or hollow, white. SPORES bright yellowish-ochraceous, subglobose, 8-10 micr. TASTE mild."

Its place of growth is only *under balsm fir.* It has been reported from Michigan, but the description given is that of Peck. The important characters seem to be the bright yellow tinged spores. It is separable from *R. puellaris,* "by the viscid cap, the gills rather widely separated from each other and nearly free, the stem never yellowish nor becoming yellow where wounded, and the spores having an ochraceous hue."

151. Russula lutea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1082.
Gillet, Champignons de France, No. 622.
Patouillard, Tab. Analyt., No. 321.
Bresadola, Fungh. mang. e. vel., Pl. 79.
Michael, Führer f. Pilzfreunde, No. 61.
Ricken, Blätterpilze, Pl. 18, Fig. 3.
Plate XXII of this Report.

PILEUS 3-6 cm. broad; *small, thin,* convex then plano-depressed, pellicle easily separable, viscid, margin *even,* becoming slightly striate in age, unicolorus, bright *yellow* or pale golden yellow. FLESH white, very thin, fragile. GILLS at length *deep yellow-ochraceous, subdistant,* rather broad in front, narrowed behind and free, equal, interspaces often venose. STEM white, unchanged, subequal, stuffed then hollow, soft, fragile, even or obscurely wrinkled, glabrous, 3-5 cm. long, 4-8 mm. thick. SPORES globose, echinulate, yellow, 8-10 micr. in diam. TASTE *mild.* ODOR none.

Solitary, in coniferous and mixed woods of northern Michigan, in frondose woods in the south. July and August. Infrequent and few in number.

Our plant is the same as the one occurring about Stockholm. It agrees with the characters as given in Hymenomycetes Europaei, except that the gills are subdistant, not truly narrow but relatively broad in front. The Stockholm specimens had the thin margins of the pileus at length slightly striate, as is also the case with the Michigan plants. Peck says he has found it but once in New York. I have found it a number of times in Michigan. *R. vitellina* Fr. which is said to resemble this species, is not known to Romell for Sweden, and he refers all their forms to *R. lutea.* It may be that *R. lutea* and *R. vitellina* represent extremes of the species. Our plant described above and that about Stockholm do not agree with either of the descriptions, but is a compromise between the two. Our plants are not strongly striate nor have they any marked odor like *R. vitellina;* on the other hand they have broader and more distant gills than is warranted by the description of *R. lutea.* According to Fries, *R. lutea* is found in beech forests and *R. vitellina* in coniferous woods. *R. flaviceps* Pk. is said to be larger, with narrow and close, pale yellow gills.

HYGROPHOREAE

Fruit body soft, fleshy. Stem central, confluent with the pileus. Gills with a waxy consistency, more or less distant, thick, well-developed, with acute edge.

This subfamily is well defined and set off from the others. The characteristics are not easily described in words, but the habit of the plants and the nature of the gills are soon learned by field study. The gills, although acute on the edge, thicken toward the pileus, and are built up of a thick central layer (the trama), coated on both surfaces by a thick, waxy, hymenial layer of long basidia, which is more or less removable.

Our species are included under two genera:

Spores white. *Hygrophorus.*

Spores blackish. *Gomphidius.*

Gomphidius Fr.

(From the Greek, *gomphos*, a wooden bolt or peg, referring to the shape of the young plants.)

Black-spored to smoky-olive-spored; *gills of a waxy* or subgelatinous *consistency*, decurrent, subdistant to distant, forked, edge acute; stem central, confluent with the pileus; pileus fleshy, *viscid;* partial veil when present membranous glutinous; spores elongated-subfusiform; cystidia abundant.

Terrestrial and putrescent fungi, very infrequent in this region, sharply distinct by the nature of its gills and spores. The genus appears to have some relationship with Hygrophorus on the one hand and with Paxillus on the other. In Europe, *G. viscidus* Fr. and *G. glutinosis* Fr. are a prominent part of the mushroom flora, although with us these two species seem to be entirely lacking, and no species can be said to be frequent. Peck has described five species from the United States; four of these came from the eastern states and are smaller than the two common European species mentioned above. Nothing is known of the edibility of our species.

The genus is best recognized by the smoky, decurrent and usually distant gills, the viscid or glutinous cap, and the spotted stem. In the young stage a viscid veil connects the margin of the pileus with

the stem; as the plant matures the veil collapses on the stem and in most cases causes the stem to appear viscid and at length spotted or blotched by the drying remnants of this veil. In our species this veil is scanty and it apparently disappears very early, and in most cases cannot be definitely seen. Our species occur in swampy ground or in tamarack bogs. Only three species have been found in the state. *G. nigricans* Pk. reported in the 8th Rep. Mich. Acad. Sci., is doubtful. *G. rhodoxanthus* (Schw.) is referred to Paxillus.

Key to the Species

(a) Pileus 2-5 cm. broad, obtuse or depressed; stem dry, becoming reddish-black spotted, yellow at base. 152. *G. maculatus* Fr.
(aa) Pileus 1-2.5 cm. broad, often umbonate; stem at first viscid from the veil, slender.
  (b) Stem yellow downwards. 154. *G. flavipes* Pk.
  (bb) Stem brick color to wine-reddish; not yellow at base. 153. *G. vinicolor* Pk.

152. Gomphidius maculatus Fr.

Epicrisis, 1836-38.

Illustrations: Ricken, Blätterpilze, Pl. 3, Fig. 2.
Plate XXIII of this Report.

PILEUS 2-5 cm. broad, convex, obtuse, soon plane or depressed, with a viscid, separable pellicle, glabrous, *brownish-incarnate to pale clay color,* rugulose, spotted and shining when dry. FLESH thick, soft, white or faintly incarnate. GILLS decurrent, narrowed behind, thickish, subdistant to distant, distinct, subgelatinous to soft-waxy, *dichotomously forked,* at first whitish, then *pale olivaceous-gray, finally smoky,* moderately broad. Stem 4-7 cm. long, apex 5-12 mm. thick, tapering downward, solid, firm, even, whitish above or with a tinge of incarnate, at first dotted with reddish scurf, glabrescent, *becoming black-spotted* or blackish in age or when handled, *base yellow.* VEIL *none* or very evanescent. SPORES variable in size, cylindrical-subfusiform to elongated-elliptical, 15-23x6-7.5 micr., smooth, pale smoky-brownish under the microscope. CYSTIDIA abundant on sides and edge of gills, cylindrical, obtuse, variable, 100-135x15-25 micr. TASTE mild. ODOR none or slight.

Gregarious, subcaespitose or scattered, under tamarack trees (Larix), in bogs, on moss or debris. Between Chelsea and Jackson. October-November. Rare or local.

Apparently this species occurs only in restricted localities in the bogs near inland lakes. This is the largest form so far found in

the state, although it varies in size and the smaller plants have less distant gills, smoother stems and smaller spores. Probably because of the advance of cooler weather the plants mature slowly and the spores have not attained their full size in the small plants. The yellow color is sometimes confined to the base, sometimes it extends halfway or more than halfway the length of the stem. The latter condition may turn out to represent *G. flavipes* Pk. The plants turn blackish when dried, but differ from *G. nigricans* Pk. in the absence of a partial veil. Ricken considers *G. gracilis* Berk. to be identical, which is very probable. *G. furcatus* Pk. differs chiefly, according to Peck's description, in the lack of the yellow color at the base of the stem; it is said to occur under tamaracks also.

153. Gomphidius vinicolor Pk. minor.

N. Y. State Mus. Rep. 51, 1898.

PILEUS 1-2 cm. broad, convex then plane, sometimes umbonate, glabrous, even, with a viscid or glutinous separable pellicle, wine-red to rufous-cinnamon, fuscous in the center, paler toward margin. FLESH thick, pale incarnate. GILLS decurrent, subtriangular, rather distant, distinct, *thickish,* broad in the middle, *not or rarely forked,* olive-brown to fuscous-brown, sprinkled by dark spores. STEM 3-4 cm. long, 2-4 mm. thick, *slender, equal,* even, solid, *viscid* from the evanescent veil, flexuous, brick-color to vinaceous, concolor within, *not yellow at base,* silky-fibrillose. SPORES elongated-oblong to subfusiform, 13-16x6-6.5 micr., smooth, smoky-brown. CYSTIDIA abundant, subcylindrical, obtuse, 120-135 x 16-18 micr. ODOR very slight but disagreeable.

Gregarious or solitary. On the ground in low, swampy woods in region of hemlock and pine. New Richmond. September. Rare.

This species is referred here as a minor form of *G. vinicolor* Pk. from whose description it differs in the smaller size and smaller spores. My experience with *G. maculatus* leads me to suspect that the spores of small plants do not mature readily, as is shown also by the less smoky gills. Peck gives the spores 17.5-20x6-7.5 micr. and the type plants were much larger. I have found our plant on several occasions and as it seems to be constant, it may be necessary to separate it. When dried, it becomes black. Some consider *G. vinicolor* Pk. identical with *G. gracilis* B. & Br.; the latter is described with the base of the stem yellow.

154. Gomphidius flavipes Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. I, Fig. 1-4.

PILEUS 1-2.5 cm. broad, convex or plane and sometimes umbonate, viscid, *dingy pink or yellowish, tinged reddish,* minutely tomentose on center, slightly fibrillose on the margin. GILLS decurrent, arcuate, subdistant to distant, *scarcely forked,* whitish then pale smoky-brownish. STEM 3-5 cm. long, 3-7 mm. thick, equal or tapering down, solid, slightly fibrillose, whitish at apex, *elsewhere yellow within and without.* SPORES elongated-fusiform, 20-30x6-7.5 micr., smooth, smoky-brown to brownish black. CYSTIDIA present.

Solitary or gregarious. On the ground in mixed woods. Harbor Springs. September. Rare.

Only one collection has been made of what seems to be this plant. The spores were clearly immature and had not yet attained the size given by Peck.

Hygrophorus Fr.

(From the Greek *hugros,* moist; and *phero,* to bear.)

White-spored. *Consistency of the gills waxy;* of pileus and stem waxy-fleshy or fleshy. Hymenophore *continuous with the trama of pileus and stem.* Stem central. Gills variously attached, soft, not membranous, edge acute. Hymenium loosely adherent to the trama of the gills. Trama of gills various: parallel, divergent or interwoven.

Putrescent, soft, terrestrial mushrooms, growing in woods, meadows, etc., and uniformly harmless. They are medium or small in size and often brightly colored. The gills are usually distant or subdistant, characters which ordinarily distinguish them from the species of Clitocybe for which those with decurrent gills might be mistaken. The genus corresponds to Gomphidius and Paxillus of the ochre-spored group, but is distinguished from them by the gills not easily separating from the trama of the pileus.

The PILEUS varies from conical to convex at first, in most cases becoming plane at maturity, with or without an umbo and sometimes umbilicate. In a great many species the expanded pileus is obversely subconical, pulling the gills into an ascending position,

so that they appear decurrent, even in those cases where they were merely adnate or adnexed at first. With age, the margin of the pileus becomes recurved or split. The surface is viscid or glutinous in many cases, others are hygrophanous, but those of one subgenus include some with a dry pileus; a small number have minute squamules over the surface or on the disk. A great variety of colors is present; white, yellow, orange, red, green, ashy, brown, etc. Some have a striate margin, and others are even and glabrous. The FLESH is usually soft, and somewhat waxy or watery, often permeated by differentiated lactiferous hyphae or crystals of oxalate of lime. The GILLS are peculiar in structure, and furnish the main characters by which we separate the genus. Their edges are acute, but they gradually thicken towards their attachment with the pileus, so as to be narrowly triangular in cross-section. The hymenial layer becomes soft when mature and rubs off from the trama proper of the gills, leaving the skeleton of trama behind. They are mostly *subdistant to distant* or very distant, and this character, along with the waxy consistency and their shape in section, constitutes a set of marks by which, after a little experience, one can tell the genus. As McIlvaine says, "There is an indescribable, watery, waxy, translucent appearance about the gills, which catches the eye of the expert, and is soon learned by the novice." Their attachment varies from adnexed to adnate and decurrent. They are usually white, but may be similar in color to that of the pileus. The interspaces are often veined in a marked fashion. The STEM is central and similar in texture to the pileus, often very fragile or watery. It is either solid or if it is stuffed becomes quickly hollow. It often splits longitudinally with considerable ease. In the subgenus Limacium, the plant when young is sometimes enveloped by a slimy universal veil which breaks up into glutinous patches, scales or flocci on the stem or pileus, or by a partial floccose veil which is connected to the margin of the pileus and to the stem; as the plant expands or dries this partial veil breaks up into a floccose annulus or more often in the form of scabrous or punctate flocci at the apex of the stem. The plants of the other two subgenera do not possess either of these veils, but those species which are viscid develop this character from the cuticle of the pileus or stem which is gelatinous and which dissolves into a slimy substance in moist weather, as in *H. psitticinus*. The SPORES may be subglobose, oval, oblong, cylindrical or elliptical. Fries (Hymen. Europ), speaks of them as "globose" only, and Patouillard says they are ovoid. DeSeynes (Ann. Sci. Nat. Ser. 5, 1 (1864) Tab. 13, Fig. 3,) figures the spores of *H.*

ceraceus as obovate with an obscure constriction in the middle, and says they vary characteristically in this genus to reniform, irregular, etc. I am quite certain that the spores are often quite irregular, angular, etc., when immature, but have a regular outline when mature, although they often tend to be slightly thicker at one end in a number of species. In most species they appear granular-punctate, and usually have a transparent spot on one side, as if perforated. Between most of our species there is not much difference in spore-size, but sufficient difference to be of diagnostic value. The spores are white in mass, and hyaline under the microscope. The BASIDIA are quite characteristic within the genus; they are long and slender, tapering to a narrow stalk. They are said to be often 2-spored. CYSTIDIA are not present in the subgenus Limacium, but occur in some of the species of the other subgenera. The ODOR is not marked in any of our species. Several European species are said to have a characteristic odor; for example: in *H. cossus* Fr. it is disagreeable, like that of a kind of moth; in *H. nitratus* Fr. it is strongly alkaline; in *H. agathosmus* Fr., like oil of bitter almonds. The TASTE is usually mild, and most of them are to be classed *among our best edible mushrooms.* The HABITAT varies. They grow on the ground, usually in moist or wet situations, in woods, copses, fields and pastures, although in our climate they develop mostly in shaded places. Some appear in early summer, and others are found only in late fall—some species never develop till after the frosts appear. *H. hypothejus* (Ricken, Blätterpilze) is said to occur only after the first frost. *H. speciosus* is found, often in good condition, as late as December first.

The genus is divided into three subgenera, fundamentally limited by the structure of the gill-trama:

I. Limacium (Hygrophorus proper).

II. Camarophyllus.

III. Hygrocybe.

These three subgenera are raised by some authors to the rank of genera, and from a scientific standpoint should be so considered. But for practical purposes the old arrangement seems better.

The key includes all species which are likely to be found within the limits of the state.

Key to the Species

(A) Plant white, disk of pileus with yellowish or reddish tints in some specimens. [See also (AA), (AAA) and (AAAA)]
(a) Pileus viscid or glutinous.
(b) Pileus entirely white, changing only in age.
(c) Stem glutinous or viscid.
(d) Apex of stem with white dots or squamules. Gills adnate to decurrent.
(e) Stem floccose-tomentose below the glutinous annulus, apex at length reddish-dotted. 156. *H. rubropunctus* Pk. (syn. *H. glutinosus* Pk.).
(ee) Stem glabrous, not annulate.
(f) Stem firmly stuffed to hollow; plant persistently white. 156. *H. eburneus* Fr.
(ff) Stem solid, plant changing color on drying. 156. *H. eburneus* var. *unicolor* Pk.
(fff) Stems solid, caespitose. 156. *H. eburneus* var. *decipiens* Pk.
(dd) Apex of stem not scabrous-scaly-dotted.
(e) Gills emarginate-adnexed; pileus at first conical. *H. purus* Pk.
(cc) Stem dry.
(d) Pileus large, 8-15 cm. broad, stout; autumnal. 165. *H. sordidus* Pk.
(dd) Pileus small, scarcely viscid, subumbilicate, thin, toughish. 170. *H. nivcus* Fr.
(bb) Pileus not entirely white.
(c) Apex of stem decorated with yellowish granules or yellow glandular dots.
(d) Pileus whitish, covered by yellowish or brownish gluten. 159. *H. paludosus Pk.*
(dd) Pileus white, with numerous golden yellow granules on margin. 155. *H. chrysodon* Fr.
(cc) Apex of stem white-scaly-dotted or slightly floccose.
(d) Disk of pileus pinkish or pale reddish-brown. 157. *H. laurae* Morg.
(dd) Disk of pileus yellowish or reddish-yellow. 158. *H. flavodiscus* Frost.
(aa) Pileus and stem not viscid nor glutinous.
(b) Plant stout. Pileus 3-7 cm. broad, dry, white. 169. *H. virgineus* Fr. (See also *H. pratensis* var. *pallidus.*)
(bb) Plant slender; pileus 1-3 cm. broad, whitish. 171. *H. borealis* Pk.
(AA) Plant yellow, bright green, olivaceous, orange or shades of these colors.
(a) Pileus glutinous or viscid when moist.
(b) Pileus at first olivaceous or green.
(c) Pileus 3-5 cm. broad, color at length orange-yellow to tawny; gills yellow. 161. *H. hypothejus* Fr.
(cc) Pileus 4-8 cm. broad; gills white-incarnate. 163. *H. olivaceoalbus* Fr.
(ccc) Pileus 1-2.5 cm. broad, parrot green at first; gills yellowish or greenish. 184. *H. psitticinus* Fr.
(bb) Pileus orange-yellow, yellow, yellowish or tawny.
(c) Becoming blackish in age or when bruised; pileus conical; gills free. 180. *H. conicus* Fr.
(cc) Not becoming black when bruised.
(d) Gills emarginate-adnexed; pileus 2-5 cm. broad, citron to golden-yellow. 178. *H. chlorophanus* Fr.
(dd) Gills broadly adnate to decurrent.
(e) Pileus 3-8 cm. broad, yellow in age; in tamarack swamps in late fall. 160. *H. speciosus* Pk.

(ee) Pileus 1-3 cm. broad.
(f) Tough; pileus tawny-yellowish, not fading in age. 182. *H. lactus* Fr.
(ff) Fragile; pileus wax-yellow to yellow.
(g) Gills truly decurrent; pileus and stem fading to whitish in age. 181. *H. nitidus* B. & C.
(gg) Gills adnate-decurrent; pileus not fading. 172. *H. ceraceus* Fr.
(aa) Pileus not viscid nor glutinous.
(b) Golden-orange-yellow; fragile; pileus and stem markedly fading; gills adnexed, deep orange-yellow. 179. *H. marginatus* Pk.
(bb) Pale yellow; pileus 6-12 mm. broad; stem darker. *H. parvulus* Pk.
(AAA) Plant vermillion, scarlet, pink, flesh-color, rufous or shades of these.
(a) Pileus viscid or glutinous.
(b) Stem stout; pileus rather large, compact, firm.
(c) Gills not becoming reddish-spotted.
(d) Pileus scarlet, crimson or orange; stem viscid, in tamarack swamps. 160. *H. speciosus* Pk.
(dd) Pileus tinged flesh color; stem dry. 164. *H. pudorinus* Fr.
(cc) Gills becoming reddish-spotted. 163. *H. Russula* (Fr.).
(bb) Stem medium or slender; pileus fragile.
(c) Pileus 1-2 cm., pinkish-flesh-color; stem slender and viscous. 183. *H. peckii* Atk.
(cc) Pileus 3-7 cm., scarlet or vermillion; stem moist, not viscid.
(d) Gills arcuate-adnate; base of stem yellow or orange. 176. *H. coccineus* Fr.
(dd) Gills slightly adnexed; base of stem white; spores larger. 177. *H. puniceus* Fr.
(aa) Pileus not viscid nor glutinous.
(b) Pileus 1-3 cm. broad, subglabrous to minutely scaly, vermillion to reddish-yellow. 175. *H. miniatus* Fr. *H. cantherellus* Schw.
(bb) Pileus 3-7 cm. broad, flesh-color to tawny-reddish, glabrous. 168. *H. pratensis* Fr.
(bbb) Pileus 3-10 cm. broad, salmon-rufous to testaceus; hoary when young; gills decurrent. 167. *H. leporinus* Fr.
(AAAA) Plant neither white, yellow, orange nor bright red.
(a) Pileus and stem glutinous or viscid. [See also (aa) and (aaa)]
(b) Gills pure white; pileus grayish-brown, cinereous or fuliginous.
(c) Stem hollow, fuliginous. 185. *H. unquinosus* Fr.
(cc) Stem solid, white or whitish. *H. fuligineus* Frost.
(bb) Gills not pure white, or at least changing in age, adnate-decurrent.
(c) Pileus purplish-red, virgate with darker fibrils; stem and gills concolor. *H. capreolarius* Bres.
(cc) Pileus some shade of brown. [See also (ccc)]
(d) Stem hollow, slender; plant fragile; pileus olive-brown, 1-2 cm. broad. *H. davisii* Pk.
(dd) Stem solid, plant firm, larger.
(e) Growing in sphagnum swamps; pileus white, covered with yellowish-brown gluten. *H. paludosus* Pk.
(ee) In grassy woods; pileus smoky-olive, 3-6 cm. broad; spores 12 x 8 micr. *H. limacinus* Fr.
(ccc) Pileus dark brownish olivaceous. 162. *H. olivaceoalbus* Fr.
(aa) Pileus with a gelatinous, subviscid pellicle; stem dry.
(b) Pileus violaceous to smoky-lilac, hygrophanous, fading to grayish; stem stuffed to hollow. 174. *H. pallidus* Pk.
(bb) Pileus livid-rufescens to brownish, hygrophanous; stem stuffed to hollow; gills decurrent. 173. *H. colemannianus* Blox.
(bbb) Pileus grayish-brown or blackish-brown; stem solid.
(c) Spores 6-8 micr. long. 166. *H. fusco-albus* var.
(cc) Spores 10-12 micr. long. *H. morrisii* Pk.

(aaa) Pileus and stem not viscid nor glutinous (slightly viscid in *H. amygdalinus*).
(b) Odor markedly noticeable.
(c) Stem solid; pileus grayish-brown; gills adnate decurrent; odor of almonds. *H. amygdalinus* Pk.
(cc) Stem stuffed then hollow; pileus hygrophanous.
(d) Gills decurrent; pileus sooty-brown (moist); spores subglobose, 5-6 micr.; odor "peculiar." *H. peckianus* Howe.
(dd) Gills sinuate-adnexed; pileus yellowish-brown (moist), odor offensive. *H. mephiticus* Pk.
(bb) Odor not marked; stem solid.
(c) Plant stout; pileus smoky or blackish, virgate with fibrils; spores 8-9x5 micr. *H. carpinus* Fr.
(cc) Plant slender; pileus grayish-brown to blackish-brown, glabrous; spores 10-12x6-7 micr. *H. nigridius* Pk.

(Peck in his monograph, N. Y. State Mus. Bull. 116, 1907, of New York species mentions the following as very rare: *H. virgatulus* Pk., *H. burnhami* Pk., *H. metapodius* Fr., *H. basidiosus* Pk., *H. subrufescens* Pk., *H. immutabilis* Pk., *H. laricinus* Pk., *H. luridus* B. & C., *H. minutulus* Pk. Peck has described also *H. serotinus* Pk., *H. ruber* Pk., *H. albipes* Pk., from Massachusetts; *H. elegantulus* Pk. from Maryland and *H. sphocrosporus* Pk. from Iowa.)

SUBGENUS LIMACIUM: Provided with a glutinous universal veil or a floccose cortina or both. *Trama of gills of divergent hyphae.*

Section I. Universales

Provided with *both* a universal veil and a floccose cortina; the latter is connate to the inner surface of the former along the stem, sometimes forming a slight annulus at the apex of the stem, or a floccose-downy edge on the incurved margin of the pileus. Stem *viscid,* subglabrous to floccose-fibrillose, *shining or glistening-spotted when dry,* apex scabrous-dotted or subglabrous.

This section is intended to include only those with a universal veil. It corresponds to the subgenus Myxacium of the genus Cortinarius. This veil surrounds the very young button as a thick gelatinous layer, which becomes attenuated on the stem as this elongates and dissolves into a hyaline, or, in some species, into a somewhat colored gluten in wet weather. The apex of the stem is glandular or scabrous-dotted in those species in which the margin of the pileus is at first inrolled, but in those in which the margin of the pileus is merely incurved and continuous with the cortina, the apex of the stem is subglabrous and not floccose-dotted. *H. speciosus* is an example of the latter group.

155. Hygrophorus chrysodon Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 112, p. 110, 1900.
Cooke, Ill., Pl. 885.
Ricken, Blätterpilze, Pl. 6, Fig. 4.

"PILEUS 3-7 cm. broad, convex then expanded, viscid (moist), shining (dry), white, *concolorous except for the numerous golden granules on the margin,* or sometimes over entire surface, margin involute at first. FLESH white, rather thick. GILLS decurrent, distant, *white or yellow-powdered on the edge,* interspaces venose. STEM 4-7 cm. long, 6-10 mm. thick, soft, equal, stuffed, white, *apex decorated by yellowish granules,* sometimes in the form of an imperfect ring. SPORES oval-elliptical, smooth, 7-10x4-6 micr., white.

"Gregarious. In late summer or autumn. On the ground in open woods."

Not yet reported from Michigan.

156. Hygrophorus eburneus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Pl. 34, Fig. 113, p. 111, 1900.
Murrill, Mycologia, Vol. 6, Pl. 131.
Hard, Mushrooms, Fig. 164, p. 207, 1908.
Marshall, Mushroom Book, Pl. 30, p. 84, 1905.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, Figs. 13-14, 1902. (As *H. laurae* var. *unicolor.*)
Peck, N. Y. State Mus. Bull. 94, Pl. 88, Figs. 8-11, 1905. (As *H. laurae* var. *decipiens.*)
Cooke, Ill., Pl. 886.
Ricken, Blätterpilze, Pl. 6, Fig. 5.

PILEUS 2-7 cm. broad, convex-expanded, *pure white* when fresh, glutinous, *shining,* even, glabrous, margin at first involute and floccose-pubescent. FLESH white, rather thick and firm. GILLS adnate to decurrent, subdistant, moderately broad behind, narrowed in front, subvenose, *white,* often dingy yellowish in age, trama of divergent hyphae. STEM 6-15 cm. long, 3-8 mm. thick, elongated, subequal, tapering or fusiform, often flexuous, glutinous, shining-spotted when dry, *persistently stuffed or becoming hollow,* glab-

rous, apex with white dots or squamules, not annulate, *white* often becoming dingy in age. ODOR and TASTE mild. SPORES cylindrical-elliptic, smooth, 6-8x4-5.5 micr. BASIDIA slender, 4-spored, 40-42x7 micr.

Gregarious or subcaespitose in woods, thickets, etc., often among grass. October-November. Frequent. Ann Arbor and probably throughout the State.

Var. *unicolor* Pk. This is said to differ by its solid stem and change of color on drying. It was referred by Peck to *H. laurae* as a variety. If it is distinct at all it appears to be better to attach it to *H. eburneus*. Gillet says the stem of *H. eburneus* is solid or hollow. There is so much variation in this respect in our plants—some having a persistent pith and appearing solid, and others becoming hollow—that it seems to me best to merge the variety in the species. Berkeley notes that sometimes the English plants turn "fox-red in parts" when they decay.

Var. *decipiens* Pk. is closely related to the preceding variety, but is caespitose and the gills are said to remain white. It was also attached to *H. laurae* by Peck.

All these have a uniform white color when young or fresh, and are provided with a hyaline, glutinous, universal veil which makes the cap and stem slippery and difficult to pull up or to handle. The shining pileus when dry reminds one of *Tricholoma resplendens*, but the pileus averages smaller than in that species, and the stem is glutinous. *Hygrophorus rubropunctus* Pk. is also said to be a white plant, but differs from the preceding by its stem being floccose-tomentose below the glutinous annulus, and studded at the apex with drops of moisture which in drying form glandular red dots; its stem is short but thick; and the spores measure 7.5-10x5-6 micr. It has not been detected by me in Michigan. These white forms are all closely allied, and may be considered variations of one species.

157. Hygrophorus laurae Morg. (Edible)

Cincinnati Soc. Nat. Hist., Vol. 6, 1883.

Illustrations: Ibid, Pl. 9.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, 1902.
Hard, Mushrooms, Fig. 170, p. 214, 1908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 10.

PILEUS 3-10 cm. broad, convex-expanded or depressed on disk,

umbonate, more or less irregular, pinkish-brown or reddish on disk, white on margin, glutinous when fresh, glabrous, even, margin at first involute. FLESH thickish, white. GILLS adnate to decurrent, subdistant, rather narrow, white or tinged with cream-flesh-color, trama of divergent hyphae. STEM 3-8 cm. long, 6-12 mm. thick, equal or tapering downward, *solid, glutinous,* white or yellowish-white, upper half often squamulose-scabrous, the apex dotted with scabrous points. SPORES elliptical, smooth, apiculate, 7-9x 4-5.5 micr., white in mass. BASIDIA slender, about 38x6 micr. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in frondose woods, thickets, etc., among fallen leaves. Detroit, Ann Arbor, New Richmond. August-November. Frequent.

This species usually has a cap which is wider than the length of the stem, while *H. eburneus* usually has an elongated stem and narrow pileus. There is some discrepancy in the spore-measurements as given by Morgan and Peck. The latter author gives them as 6-7.5 micr. long. Such discrepancy usually points to different species studied by the different authors, but in the genus Hygrophorus, as in some other white-spored genera, the spores often mature slowly, and it is often not easy to distinguish mature from immature plants, so that the best of observers may disagree. *H. laurae* is said to stain one's fingers as if with sumach. (S. Davis, Rhodora, 13, p. 63, 1911.)

158. Hygrophorus flavodiscus Frost (Edible)

N. Y. State Mus. Rep. 35, 1884.

Illustrations: Peck, N. Y. State Mus. Mem., Vol. 3, Pl. 50, Fig. 1-6.
Hard, Mushrooms, Fig. 167, p. 210, 1908.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 11.

PILEUS 3-7 cm. broad, convex or nearly plane, *glutinous* when fresh, *pale yellow or reddish-yellow on disk,* white elsewhere, glabrous, even, margin at first involute. FLESH white. GILLS adnate to decurrent, subdistant, white sometimes with a slight flesh-colored tint, trama of divergent hyphae. STEM 3-7 cm. long, 6-12 mm. thick, nearly equal, *solid,* very glutinous, apex with white scabrous points, white or yellowish below. Spores elliptical, inequilateral, 6-7.5x4-5 micr., white.

Gregarious. On the ground in hemlock and beech woods. New Richmond. September.

This is close to the preceding, and may be a form of it peculiar to conifer woods. Peck thinks it belongs nearest to *H. fuligineus,* in whose company he has found it. According to this author, there are no scabrous points at the apex of the stem. In my specimens they were present, at least in the younger stages. The species was first published by Peck who obtained the name from Frost's manuscript description. The pileus has a thick fleshy disk, its margin is at first inrolled and is densely white-floccose on the side next the stem. The gills are sometimes intervenose; at first they are simply adnate, but on the expansion of the pileus become decurrent. This change from the young to the old gills has caused some discrepancies in the descriptions by different authors of this and the preceding species. The layer of glutinous tissue is very thick on the cap, thin on the stem.

159. Hygrophorus paludosus Pk.

Torr. Bot. Club Bull., Vol. 29, 1902.

"PILEUS 2-4 cm. broad, convex, obtuse, *whitish,* covered with a thick *yellowish or brownish gluten.* FLESH white. GILLS adnate or slightly decurrent, subdistant, whitish, *stained with greenish-yellow when old.* STEM 5-10 cm. long, 4-6 mm. thick, subequal, *long and slender,* flexuous, often curved at the base, *solid,* glutinous, white with yellow glandular dots at the top, streaked with brownish fibers or shreds of the dried gluten when dry. SPORES broadly elliptical, 8-10 x 5-7 micr., white. ODOR earthy. TASTE slightly *acrid.*"

Growing among peat mosses. Greenville. September. Reported by Longyear.

The yellowish dots at the apex of the stem are said to become black on drying, and there are yellowish stains at the base of the stem. The plant seems rare, as it has not been reported since its discovery. It needs further study to show its relationship.

160. Hygrophorus speciosus Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 51, Fig. 21-28. 1900, and Rep. 29, Pl. 2, Fig. 1-5, 1878.
Hard, Mushrooms, Fig. 168, p. 211, 1908.
Fries, Icones, Pl. 166 (*Hygrophorus aureus* Fr.).

Bresadola, Fungi Trid., Vol. I, Pl. 9 (*Hygrophorus bresadolae* Quel.).
Plate XXIV of this Report.

PILEUS 2-8 cm. broad, oval, subconic or flattened convex when young, broadly convex and at length almost plane when mature, or varying subcampanulate and umbonate, umbo usually subobsolete, *glutinous* when fresh, *bright red or orange-vermillion* when young or in full vigor, becoming paler with age or after freezing, often subvirgate, even or slightly rugulose from the drying gluten, margin at first incurved then decurved or spreading. FLESH white or tinged orange under the separable pellicle, soft, rather thick. GILLS decurrent, *distant, moderately* broad in middle, acuminate at ends, arcuate, thick, intervenose, white or tinged yellowish, trama of divergent hyphae. STEM stout, 3-10 cm. long, 8-20 mm. thick, variable in length, equal or irregularly subcompressed, soft and spongy within, *not hollow,* straight or flexuous, *hyaline-white, floccose-fibrillose to the apical, obsolete annulus,* almost glabrous at times, variegated with glistening spots from the drying of the gluten, sometimes ochraceous-stained when old, apex subglabrous to silky, base usually deeply imbedded in substratum or subrooting. UNIVERSAL VEIL of hyaline gluten. SPORES 8-9.5 x 5-6 micr., broadly elliptical, smooth, white in mass. BASIDIA slender, 50-60 x 6-8 micr., 4-spored, sterigmata long and prominent. ODOR and TASTE mild.

In troops, etc., solitary or caespitose. In tamarack swamps. Ann Arbor. October-November. Frequent locally, appearing every fall in the same places.

This is the American form of *Hygrophorus aureus* of Europe. The illustrations of European authors as well as those of Peck, indicate a smaller average size and a pileus markedly umbonate. In our region as well as in the Adirondack Mountains I have seen such plants occur with the rest, but the majority are broadly convex with or without an obsolete umbo and as a rule are larger than the European form. Sometimes vestiges of a distinct floccose annulus occur, but more often this cannot be seen; on the other hand, the stem is usually covered by a white, floccose-fibrillose, appressed sheath which becomes dingy ochraceous or pale sordid reddish on drying, especially where gluten has dropped from the margin of the cap on the stem. Plants in the same patch vary greatly in the size of the pileus and the stem. The stem of the young plant is at first large and stout as compared with the flat or convex, narrow young pileus. The partial veil is floccose-fibrillose. The margin of

the pileus is merely incurved at first, not inrolled as it is said to be in *H. glutinifer* Fr. The color of the pileus of the typical American plant is a brighter red than that in Europe. This, however, is not unusual, as the reverse is true in *Amanita muscaria.* The pileus usually becomes pallid yellowish after exposure to sun and wind, or after being frozen. In the Adirondack Mountains I collected a color variety growing with the species, which differed from it at every stage of its development by its cadmium-yellow pileus. *Hygrophorus coloratus* Pk. is said to differ from *H. speciosus* by having a stuffed or hollow stem and a partial, floccose, white veil. As the latter is sometimes noticeable in the Michigan plants, and because of the soft structure of the interior of the stem in our plants, I doubt whether *H. coloratus* is more than a variety of the species.

161. Hygrophorus hypothejus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Plate 891.
Patouillard, Tab. Analyt., No. 510.
Gillet, Champignons de France, No. 337.
Ricken, Blätterpilze, Pl. 5, Fig. 5.

"PILEUS 3-5 cm. broad, convex-expanded, at length depressed in center, obtuse, glutinous, *olive-brown,* virgate with radial fibrils, even, *becoming pale, or citron-golden-yellow, tawny after the disappearance of the olive-brown superficial gluten.* FLESH pale yellowish with a yellow periphery, thin. GILLS decurrent, distant, *yellow* to orange-yellow, thickish. STEM 5-7 cm. long, 6-8 mm. thick, equal, stuffed to hollow, yellow to pale yellowish, glabrous, glutinous, *evanescently annulate from the partial floccose veil.* SPORES cylindrical-elliptical, smooth, 7-9 x 4-5 micr. ODOR and TASTE mild."

This species has not yet come to my notice within the State. It is said to be more common farther south, although its known northern limit should include Michigan. It is an inhabitant of pine woods, and Ricken says it never appears until after the first frost in the autumn, when it flourishes till the snow falls. Its yellow gills distinguish it from related species. Some consider *H. fuligineus* Frost identical.

162. Hygrophorus olivaceoalbus Fr.

Syst. Myc., 1821, and Fung. Trid., 1881.

Illustrations: Fung. Trid., Vol. I, Pl. 92.
Plate XXV of this Report.

PILEUS 4-8 cm. broad, at first acorn-shaped or rounded-campanulate, then convex to subexpanded, umbonate, umbo often obsolete, *covered by a thick gluten, dark, olive-gray,* stained ferruginous in age, at length somewhat wrinkled from the drying gluten, margin at first involute. FLESH white, thick, rather soft. GILLS adnate to decurrent, subdistant to close, moderately broad, distinct, white or slightly incarnate, trama of divergent hyphae. STEM rather stout, 4-7 cm. long, 8-15 mm. thick, equal or tapering downward, *peronate at first and floccose-scaly from the glutinous veil,* at length marked by rusty-fuscous, subannular, irregular stains, apex at first beaded with drops and densely white-scaly-dotted, solid, subrooting and curved at base. SPORES broadly elliptical, smooth or slightly rough-punctate, 9-12 x 6-7 micr. BASIDIA elongated, 50 x 8-9 micr. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in woods of oak, maple, etc. Ann Arbor. October. Found but once.

This is a very marked species. The sheathed, floccose stem with its several rings of staining gluten separates it from nearby species. The base of the stem is usually deep in the ground. Bresadola's figures show a darker plant, while Gillet, Michael and Ricken figure a more slender plant. The colors of our plants approach more nearly those of the last three authors.

Section II. Partiales. Universal veil none. Partial veil or cortina floccose, adhering to the involute margin of the pileus. Stem *dry,* apex floccose-scabrous or subglabrous.

This section corresponds to the subgenus Phlegmacium of the genus Cortinarius. The stem is dry except when the gluten of the cap falls upon it. The viscidity of the pileus is due to a gelatinous layer on its surface which becomes glutinous in some species in wet weather.

163. Hygrophorus Russula Fr. (Edible)

Syst. Mycol., 1821 (as Tricholoma).

Illustrations: Hard, Mushrooms, Fig. 51, p. 71, 1908. (As *Tricholoma Russula.*)
Michael, Führer f. Pilzfreunde, Vol. II. (as *Tricholoma Russula.*)
Ricken, Blätterpilze, Pl. 4, Fig. 1.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, Fig. 1-5, 1902. (As *Tricholoma Russula.*)
Bresadola, Fungh. mang. e. vel., Pl. 22. (As *Tricholoma Russula.*)
Plate XXVI of this Report.

PILEUS 5-12 cm. broad, firm, convex, at length plane or depressed with margin elevated-wavy, *viscid* when moist, *pale pink to rosy-red,* somewhat variegated, disk somewhat scaly-dotted, margin at first involute and floccose-pruinose. FLESH compact, thick, white or at length reddish-tinged. GILLS rounded behind, at length spuriously decurrent, narrow, acuminate at ends, thickish, white at first then reddish-spotted, *trama of divergent hyphae.* STEM stout, usually short, 3-7 cm. long, 15-25 mm. thick, firm, solid, *dry,* equal or subventricose, apex white-flocculose, *white, becoming reddish in age.* SPORES narrowly elliptical, apiculate, smooth, white in mass. BASIDIA slender, elongated, 45 x 5-6 micr. ODOR and TASTE mild.

Solitary or caespitose in troops. On the ground, among leaves, in frondose woods of oak, maple, etc. Ann Arbor, Detroit, Marquette, New Richmond and throughout the State. September-November. Common.

This Hygrophorus has usually been placed with the Tricholomas with which it has some affinity; but the character of the gills, which are somewhat waxy and whose trama is composed of divergent hyphae, the attenuated lower part of the basidia and its general characters ally it much better to Hygrophorus where Quelet and Ricken also place it. The involute, slightly floccose margin of the pileus is similar to that of *H. pudorinus.* It often occurs in troops in late autumn, when it is covered by leaves which it pushes up so as to form humps which betray its presence. It is among the very best of edible mushrooms, especially after cold weather sets in, at which time it is free from grubs. The bright color is similar to that of some Russulas, hence the specific name. *Tricho-*

loma rubicunda Pk. is doubtless *H. Russula* in spite of the argument for its autonomy by E. M. Williams in the Plant World, Vol. 4, p. 9, 1901. *H. crubescens* Fr. is similarly colored, but consistently of a different habit, long stemmed and narrow-capped. The latter species as I saw it in Sweden, seems to me to be quite distinct.

164. Hygrophorus pudorinus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Plate 911.
Gillet, Champignons de France, No. 347.
Peck, N. Y. State Mus. Bull. 67, Pl. 83, 1903.
Ricken, Blätterpilze, Pl. 4, Fig. 3, 1910.

PILEUS 2-10 cm. broad, firm, convex-campanulate, subexpanded, obtuse, *viscid* when moist, *pale tan color, pinkish-buff or tinged incarnate,* glabrous, even, margin at first involute and minutely downy. FLESH compact, thick, white or tinged flesh-color. GILLS acuminate-subdecurrent, subdistant, thickish, narrow, sometimes forked, interspaces venose, *usually connected at the stem by a narrow border,* trama of divergent hyphae. STEM 3-8 cm. long, 5-20 mm. thick, *stout,* compact, solid, *dry,* equal or tapering downward, white, buff or incarnate-tinged, *floccose-scabrous at apex,* floccose-fibrillose or glabrescent downwards. SPORES cylindric-elliptical, smooth, 6-9 x 3.5-5 micr. BASIDIA slender, 45-50 x 6-7 micr., 4-spored. ODOR and TASTE mild. *Edible.*

Gregarious to caespitose. On the ground, often among grass, in hemlock or frondose woods or thickets. Ann Arbor, Detroit, New Richmond. September-November. Frequent.

This is a variable species with us as regards size and coloration. Late in the season a small form appears (form *minor*) which has always a white stem, and forms considerable patches in oak woods. It is possible that this form is *H. arbustivus* Fr. In the typical and luxuriant specimens of *H. pudorinus* the stem is tinged flesh-color to pale isabelline. Occasional specimens are larger than the sizes given above, which are made to include form *minor*. All of these are delicious food.

165. Hygrophorus sordidus Pk. (Edible)

Torrey Bot. Club, Bull. 25, 1898.

Illustrations: Hard, Mushrooms, Fig. 176, p. 220, 1908.
Plate XXVII of this Report.

PILEUS *large,* 8-16 cm. broad, convex-expanded to plane, firm, *viscid* when moist, pure white, rarely tinged yellowish-buff, glabrous, even, margin at first incurved and slightly floccose. FLESH compact or somewhat soft, white, *thick.* GILLS adnate to decurrent, subdistant, rather broad in middle, attenuate at both ends, *white,* slightly yellowish in age, waxy, interspaces sometimes veined, trama of divergent hyphae. STEM *stout,* 6-10 cm. long, 15-30 mm. thick, *short,* solid, *dry,* equal or attenuated downwards, white, glabrous or obscurely floccose-mealy at apex, even. SPORES elliptical, smooth, 6-8 x 4-5 micr. ODOR and TASTE mild.

Gregarious. On the ground among leaves in frondose woods of maple, oak, etc. September-November. Ann Arbor, New Richmond. Frequent locally.

This is the largest and finest of the genus. Small individuals may be confused with *Tricholoma resplendens,* but due regard to broader pileus, shorter stem and the waxy gills which are decurrent in expanded plants, will distinguish it at once. Microscopically the divergent hyphae of the gills, as well as the basidia, are a certain distinction. It has been met with for a series of years, every autumn, and is consistently a large white plant, so that it can hardly be referred to *H. pudortnus.* When young, a floccose cortina is present. The universal veil is entirely lacking. It is edible, and vies with any mushroom in its abundant flesh and pleasant flavor. The pileus is sometimes quite obscured by adhering leaves or dirt.

166. Hygrophorus fusco-albus Fr. var. occindentalis var. nov.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Plate 899.
Plate XXVIII of this Report.

PILEUS 2-5 cm. broad, convex-expanded, at length plane or depressed, *viscid* when moist, *livid grayish-brown to brownish-ashy,* sometimes blackish on disk, glabrous, even, becoming fragile, margin at first involute and floccose-downy. FLESH white, *rather thin,*

rather soft. GILLS adnate to decurrent, subdistant to close, *rather narrow,* creamy-white, interspaces venose, *trama of divergent hyphae.* STEM slender, rarely stout, 3-7 cm. long, 4-6 mm. thick (rarely 10-12 mm.), equal or tapering downward, *dry,* solid, straight, or curved at base, sometimes flexuous, rather fragile, apex floccose-scabrous, *floccose-pruinose elsewhere,* glabrescent, *white or pallid.* SPORES elliptical, smooth, 6-8 x 3.5-4.5 micr., white. BASIDIA slender, 36-38 x 6-7 micr., 4-spored. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in oak woods. Ann Arbor, Detroit. October. Infrequent.

This plant has been found in several places in successive years. It is well-marked, but differs in some respects from the published descriptions and figures of *H. fusco-albus.* It appears that there is no unanimity among European mycologists as to this species. It was first figured by Lasch. Ricken figures it as a stout plant with a viscid stem and says the stem is glutinous-peronate. This departs widely from the description of Fries, Gillet, Massee and others. Cooke's figure more nearly depicts our plant. Fries says the gills are broad, but in our specimens they were always rather narrow. Peck (N. Y. State Mus. Bull. 116) has included it under *H. fusco-albus,* in the sense of Fries, in his monograph. The spores of our plant are slightly smaller than given by Peck, and much smaller than those given by Cooke and Massee. In view of these discrepancies and differences, it has seemed best to bestow on our plant at least a varietal position. It seems to come halfway between *H. fusco-albus* and *H. livido-albus.* The partial floccose veil disappears early except on the involute edge of the pileus. The stem is delicately floccose and entirely dry when fresh or young.

167. Hygrophorus leporinus Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 930.

PILEUS 3-10 cm. broad, at first oval-campanulate, at length expanded-plane, obtuse, often gibbous or irregular, opaque, *rufous-testaceous* to fulvous-rufescent, *variegated with a white, hoary, silkiness when young,* especially on margin, provided with a subviscid, separable, thin pellicle, becoming subfibrillose or subvirgate. FLESH thick, compact on disk, abruptly thin on margin, firm, pallid, tinged rufescent to rufous-fulvous. GILLS arcuate-*decurrent, rigid, thick, subdistant,* distinct, attenuate at both ends, *ferrugi-*

nous-fulvous to gilvous, pruinose, trama divergent. STEM 3-8 cm. broad, subequal or tapering downward, *attenuated at base,* often curved, rigid, 8-16 mm. thick above, at first with an appressed, glaucous silkiness, glabrescent, innately fibrous and shining, *solid, rufescent* within and without. SPORES narrowly elliptic-lanceolate to ovate, smooth, 7-9 x 4 micr., white. BASIDIA very slender, about 60 x 4 micr. ODOR none. TASTE mild.

Scattered or gregarious. On the ground among fallen leaves in frondose woods. October. Ann Arbor. Rare.

I have referred this large, well-marked plant to the above species on the strength of Cooke's figure, but with some hesitancy. It agrees well with that illustration. *H. leporinus* is usually placed under the subgenus Camarophyllus, but the divergent gill-trama of our plant indicates plainly its position in my grouping. The spore-measurements do not agree with those given by others. Massee says they are subglobose, 5-6 micr.; Ricken describes them as cylindric-elliptical, like ours, but smaller, 5-6 x 4 micr., which approximates somewhat closely. Berkeley says spores of *H. leporinus* are umber-colored; this is manifestly an error. The rather rigid habit and color suggest a large and deeply colored *Clitocybe laccata,* but otherwise they have nothing in common. The whole plant is more or less salmon-rufescent in color. The trama of the gills is composed of slender, diverging, compact hyphae, 5-7 micr. in diameter. The trama of the pileus is also pseudo-prosenchymatous, i. e., of narrow, compact hyphae. The species is variable in size and stout even when young. It is not found till late fall. It may turn out to be distinct.

SUBGENUS CAMAROPHYLLUS. Veil none. *Trama of gills of interwoven hyphae.* Pileus and stem usually dry. Stem glabrous or fibrillose, not scabrous-punctate at the apex.

Although this subgenus was separated by Fries from the subgenus Hygrocybe on account of its "firm, non-viscid" pileus, he nevertheless, placed under it a number of thin, viscid species like *H. fornicatus, H. niveus,* etc. In view of the fact that such typical species of this group as *H. pratensis* and *H. virgineus* have a gill-trama of interwoven hyphae, and typical species of the subgenus Hygrocybe have a gill-trama of parallel hyphae, it seems that we have here a fundamental and natural separation of the two groups, as was insisted on by Fayod (Ann. d. Sci. Nat., 7 Ser., Vol. 9, p. 305). Thus, despite the statement of Peck and Earle, the dry character of the pileus cannot be retained to characterize this subgenus.

168. Hygrophorus pratensis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 917 and 932.
Ricken, Blätterpilze, Pl. 7, Fig. 2.
Gillet, Champignons de France, No. 345.
Swanton, Fungi, Pl. 9, Fig. 11-12, 1909.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 1.
Peck, N. Y. State Mus. Rep. 48, Bot. ed., Pl. 28, Fig. 11-17, 1896.

PILEUS 2-7 cm. broad, disk compact, convex, subexpanded, often turbinate, obtuse or umbonate, glabrous, even, *reddish-fulvous or pale tawny,* moist when fresh, not viscid, margin thin. FLESH white or tinged like pileus. GILLS decurrent, distant, *thick,* whitish, yellowish or tinged like pileus, *intervenose,* very broad in the middle, trama of interwoven hyphae. STEM short, 4-7 cm. long, 7-12 mm. thick, equal or narrowed downwards, *glabrous,* even, persistently stuffed, white or tinged like the pileus. SPORES 6-8 x 4-5.5 micr., broadly elliptical or elliptic-ovate, smooth, white. BASIDIA slender, 40-42 x 5-6 micr. ODOR and TASTE mild.

Solitary, gregarious or caespitose. On the ground, woods, thickets, grassy places, etc. Marquette, Houghton, Bay View, New Richmond, Ann Arbor, etc. Most common apparently in the northern part of the State; mostly in frondose woods. July-October. Frequent.

Var. *pallidus.* Plant whitish (Detroit).

Var. *cinereus.* Plant cinereous or stem whitish. Otherwise like the typical form.

The dry surface of the pileus often becomes rimulose in expanded plants from the cracking of the cuticle. Such a condition is shown in Hard's Fig. 163, Plate 24, op. page 204; in other respects that illustration does not show the characteristic top-shaped pileus of the plant, nor the short stubby stem. It is distinguishable by its glabrous cap and stem, its top-shaped pileus and the compact flesh of the center of the cap. It grows more often in exposed, grassy places than our other Hygrophori.

169. Hygrophorus virgineus Fr. var. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 175, p. 219, 1908.
Peck, N. Y. State Mus. Mem. 4, Pl. 52, Fig. 8-12, 1900.
McIlvaine, American Mushrooms, Pl. 37, Fig 6, p. 146, 1900.
Cooke, Ill., Pl. 892.
Gillet, Champignons de France, No. 351.

PILEUS 2-5 cm. broad, convex, *often plane to depressed, dry,* obscurely pruinose, even *white,* margin thin. FLESH thick in center of cap, white. GILLS decurrent, close to subdistant, thickish, white or at length tinged cream-flesh color, scarcely ever forked or veined, trama of interwoven hyphae. STEM short, 2-4 cm. long, 6-10 mm. thick, equal or tapering either way, solid, *white* within and without, *glabrous,* even. SPORES narrowly ovate or elliptic-ovate, smooth, 6-8 x 3.5-4 micr. ODOR and TASTE mild.

Solitary or gregarious. On sandy ground, in mixed, open woods of pine, beech and maple. New Richmond, Detroit. September-October. Found infrequently.

This species, it is said, is to be looked for among grass in meadows, etc., but the writer has not found it in such localities. The description applies to the American form, which is usually smaller, its cap is rarely distinguished by rimose cracks, and the spores are smaller than given for the European plant. The recorded European spore-measurements vary from 8-10 x 5 to 10-12 x 6-7 micr. Our plant is probably a distinct variety if not a species. It has also closer gills than the type. It is hard to distinguish from the pallid variety of *H. pratensis* except for its narrower spores, and less umbonate or turbinate pileus, which is commonly pure white.

170. Hygrophorus niveus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Michael, Führer f. Pilzfreunde, Ill. No. 89.
Ricken, Blätterpilze, Pl. 7, Fig. 3.
Cooke, Ill., Pl. 900.

PILEUS 1-3 cm. broad, convex or campanulate at first, then plane, *umbilicate, hygrophanous-white,* glabrous, slightly viscid, *striatulate when moist.* FLESH *thin,* white. GILLS decurrent, distant, narrow, white, thin, subvenose, trama of interwoven

hyphae. STEM 2-8 cm. long, 2-5 mm. thick, stuffed then usually hollow, equal or tapering downward, *white,* glabrous. SPORES broadly elliptical, smooth, 7-8 x 5-6 micr. CYSTIDIA none. BASIDIA 40-45 x 5-6 micr., slender. ODOR none.

Gregarious. On moist ground in low woods or on mosses in swamps. Ann Arbor, New Richmond, Marquette. Throughout the State. August-September. Infrequent.

Most of our collections were composed of small plants, with slender stems often only 2 mm. thick. The pileus varies from truly convex to campanulate in the same patch. In some localities the pileus was tinged a slight cream-color, but otherwise the plant was the same. The umbilicus is sometimes obsolete. The pileus has a thin subviscid pellicle. This species, with us, differs from *H. borealis* in its more slender habit and its pileus, which is very thin and umbilicate on the disk. It is rather tough, and when moist the pileus is slightly viscid.

171. Hygrophorus borealis Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-3.5 cm. broad, convex then subexpanded, obtuse, *moist,* glabrous, *even,* white. FLESH thickish on disk, thin elsewhere, concolor. GILLS decurrent, arcuate, distant, intervenose, white. STEM slender, 2-5 cm. long, 2-5 mm. thick, firm, equal or tapering downward, straight or flexuous, stuffed, white, glabrous. SPORES 7-9 x 5-6 micr., broadly elliptical. ODOR none. TASTE mild.

Gregarious or subcaespitose. On moist ground in swamps or woods of birch, maple, hemlock, etc. Marquette, New Richmond, Ann Arbor. August-October. Infrequently found, but probably common in our northern woods.

This is a slightly larger and firmer species than the preceding. Its pileus is rarely striate and is not viscid. It is, however, closely related to *H. niveus.* No data are at hand to determine what may be the structure of the gill-trama.

Var. *subborealis,* var. nov. A plant has been found which simulates *H. borealis,* whose spores are markedly larger. If these prove to be constant, it deserves to be considered a separate species. The full description follows:

PILEUS 1-3 cm. broad, convex, broadly umbonate, obtuse or sometimes depressed-umbilicate, *thick on disk,* firm, watery white, *sub-hygrophanous,* not shining, *glabrous,* even, the thin margin at first slightly incurved, at length spreading. FLESH white. GILLS

decurrent, distant, *veined,* forked, concolor, trama of interwoven hyphae. STEM 3-4 cm. long, 4-7 mm. thick, tapering downward, dull white, stuffed then hollow, glabrous or innately silky-fibrillose. SPORES *cylindric-elliptical,* smooth, 10-12 (rarely 13) x 4-5.5 micr. BASIDIA slender, 45-50 x 6-7 micr., with sterigmata about 6 micr. long. ODOR none. TASTE mild.

Ann Arbor, New Richmond. August-October.

172. Hygrophorus ceraceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde I, No. 33.
Hard, Mushrooms, Fig. 174, p. 218.
Cooke, Ill., Pl. 904 (B).
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 2.

PILEUS 1-4 cm. broad, convex-capmanulate, obtuse, soft and *fragile, viscous,* pale ceraceus to lemon-yellow, sometimes tinged orange, *not pallescent,* pellucid-striate, glabrous. FLESH concolor, fragile. GILLS broadly adnate to subdecurrent, broad behind to subtriangular, thickish, subdistant, pale yellowish or whitish, trama of interwoven hyphae. STEM 2-5 cm. long, 2-4 mm. thick, equal, terete or compressed, *hollow,* glabrous, slightly viscid, soon dry, shining-undulate, waxy-yellow, sometimes tinged orange. SPORES 6-8 x 4 micr., short-elliptic, smooth. CYSTIDIA none.

Gregarious. On moist ground, in woods of the northern and western part of the State. July-September. Frequent.

This little species is usually placed under the subgenus Hygrocybe, but the interwoven hyphae of the gills bar it. It is distinguished from *H. nitidus,* a very similar species, by the color of the cap not fading as in that species; and from *H. chlorophanus* by the broadly adnate or subdecurrent gills. It seems to prefer the region of conifer woods, although it is not necessarily found only among conifers.

173. Hygrophorus colemannianus Blox.

Outlines of British Fungology, Berkeley, 1860.

Illustrations: Cooke, Ill., Pl. 903.
Bresadola, Fung. Trid., Vol. 2, Pl. 125.
Ricken, Blätterpilze, Pl. 7, Fig. 5.
Plate XXIX of this Report.

PILEUS 1.5-4 cm. broad, convex with obtuse umbo, *finally turbinate* and plane to depressed, *hygrophanous,* with a thin, separable, subviscid pellicle, even or at length pellucid-striate, glabrous, livid rufescent then *brownish-flesh color,* margin soon spreading. FLESH thin except disk, rather fragile, concolor. GILLS *decurrent* from the first, distant, not broad, acuminate at ends, very veiny, whitish, tinged grayish-brown, *trama of interwoven hyphae.* STEM 3-6 cm. long, 3-6 mm. thick, *equal or subequal,* elastic, innately fibrillose-striatulate, apex naked, stuffed or at length hollow, *whitish.* SPORES broadly elliptical, smooth, 6-9 x 5-6 micr., white. BASIDIA slender, 40 x 6 micr., 4-spored. CYSTIDIA none. ODOR none. TASTE mild.

Gregarious or solitary. On the ground in mossy or grassy moist places, in low woods or edge of swamps. Ann Arbor, New Richmond. Infrequent.

Bresadola gives a good figure, though our plants average smaller than his. It has the shape of *H. pratensis* but is hygrophanous and thinner, and must not be confused with the gray variety of that species. It prefers springy or moist places. The entire lack of odor separates it from *H. foetens* Phil. and *H. peckianus* Howe.

174. Hygrophorus pallidus Pk.

Torrey Bot. Club, Bull. 29, p. 69, 1902.

Illustration: Plate XXIX of this Report.

PILEUS 2-6 cm. broad, convex-campanulate, then expanded-plane to subdepressed, subturbinate, *hygrophanous,* glabrous, *smoky-violaceous or smoky-lilac when fresh and moist,* fading to pale gray, *with a thin gelatinous pellicle,* subviscid when moist, soon dry and shining, even. FLESH white, rather thin. GILLS arcuate-adnate to decurrent, *distant,* not broad, intervenose, *colored like the pileus when moist,* at length whitish or grayish-white, trama of interwoven hyphae. STEM 3-6 cm. long, 2-8 mm. thick, slender or stout, equal or narrowed downwards, slightly fibrillose or glabrous, *apex naked,* at first *stuffed by a large soft pith which disappears,* at length hollow and easily splitting, white or pale silvery-gray. SPORES ovate-subglobose, smooth, 5-6.5 x 4-5 micr. BASIDIA short, 30 x 6-7 micr. ODOR none. TASTE mild.

Gregarious or solitary. On moist ground in low woods or swamps. Ann Arbor, Marquette, Negaunee, New Richmond. Rather rare.

A beautiful Hygrophorus when fresh and moist, but very variable in the degree of color and viscidity. The deep color and the viscidity of the pileus disappear quickly on exposure to the wind, causing it to appear like quite a different plant. The gelatinous cuticle can, however, be demonstrated in all conditions by means of the microscope. Examples of our specimens were seen by Simon Davis, who collected the type specimens which were named by Peck. *Hygrophorus subviolaceus* Pk. is very close to it, according to the description, differing only in its solid stem; Peck has, however, referred it to the subgenus Limacium. I suspect that *H. caerulescens* B. & C. is the same plant.

SUBGENUS HYGROCYBE. Veil none. *Trama of gills of parallel hyphae.* Entire fungus thin, watery-succulent, fragile. Pileus viscid when moist, shining when dry, rarely floccose-scaly. Stem *hollow,* not scabrous-punctate at apex.

Most specimens of this subgenus are brightly colored, are soft, and grow in moist or wet places. As no data are at hand concerning the gill-trama of several species, these have been included temporarily under the subgenus Hygrocybe.

175. Hygrophorus miniatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 171, p. 215.
Marshall, Mushroom Book, Pl. X, p. 60, 1903.
Peck, N. Y. State Mus. Rep. 48, Pl. 28, Fig. 1-10, 1894.
White, Conn. State Nat. Hist. Surv., Bull. 15, Pl. 18, 1910.
Cooke, Ill., Pl. 921 (A).
Ricken, Blätterpilze, Pl. 8, Fig. 9.

PILEUS 1-3 cm. broad, convex-subexpanded, at length *umbilicate,* never viscid, vermillion, reddish-yellow or yellow, fading, *minutely tomentose, at length minutely scaly, sometimes glabrous,* even, fragile. FLESH thin, yellowish to pale. GILLS adnate to subdecurrent, subdistant, orange-red or yellow, at length paler, thickish, trama of parallel hyphae. STEM 2-7 cm. long, 3-5 mm. thick, equal, almost cylindrical, orange-red or yellow, stuffed, at last hollow, *dry,* glabrous. SPORES *variable,* broadly elliptical, 7-9.5 x 5-6 micr. ODOR and TASTE mild.

Var. *Cantherellus* Schw. (*Hygrophorus Cantherellus* Schw.) Stem longer and more slender, pileus narrower, gills a little more decurrent, spores the same.

Illustrations of the variety:
Hard, Mushrooms, Fig. 165, p. 208, 1908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 9.
Marshall, Mushroom Book, Pl. X. p. 60, 1903.
Peck, N. Y. State Mus. Rep. 54, Pl. 76, Fig. 8-20, 1901.

The var. *Cantherellus* is much more common with us than the type, but it intergrades so much that it is often difficult to decide on the identity. The characters usually given for its separation, viz., the decurrent gills, minutely scaly pileus and slender stem, do not always hold good, so that it can hardly be an autonomous species. Numerous collections show all possible combinations, although the commonest type in Michigan is the plant with narrow pileus and a stem 2-3 mm. thick and 5-7 cm. long. A number of *color forms* of both have been named as varieties: (a) with red or orange cap and yellow stem; (b) with yellow pileus and red stem; (c) with both stem and pileus pale yellow. Var. *sphagnophilus* Pk. is more marked, grows in sphagnum bogs, is very fragile and the white base of the stem is imbedded and attached to the moss. The spores of the whole series are rather variable, even in the same collection, but fall within the limits given above. Massee and Cooke give the spore lengths a little large for our plants. The color varies greatly and fades in age.

Gregarious or subcaespitose. On the ground in moist conifer or frondose woods or on mosses. Throughout the State. June-October. Quite common.

176. Hygrophorus coccineus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Swanton, Fungi, Pl. 9, Fig. 4-6.
Cooke, Ill., Pl. 920.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 7.
Plate XXX of this Report.

PILEUS 2-7 cm. broad, *campanulate* or sometimes convex, *scarcely expanded,* obtuse, subviscid, *cherry red or blood-red, fading,* glabrous, even. FLESH thin, *fragile, concolor.* GILLS *arcuate-adnate,* somtimes with decurrent tooth, *subdistant* to *distant,* orange-red to yellow, at length glaucous, thickish, intervenose, trama of parallel hyphae. STEM 4-7 cm. long, 3-9 mm. thick, varying much in thickness, subequal or tapering downward, often *com-*

pressed and furrowed, hollow, blood or cherry-red, *orange or yellow at base,* often undulate-uneven, *naked.* SPORES *broadly elliptical,* 7-9 x 5-6 micr. BASIDIA 40-50 x 6-7 micr. ODOR and TASTE none.

Gregarious. On the ground, in low meadows or moist woods, thickets, clearings, etc., of conifer or hardwood regions. Marquette, Houghton, Detroit. Throughout the State. July-October. Infrequent; more frequent in the northern part of the State.

Among the largest of the bright-colored species of this group, approaching *H. puniceus* in size in spite of the notes of some authors that it is smaller. It is variable in size, has a firm appearance, but is rather brittle. This is one of our most beautiful mushrooms when well developed. It is easily confused with *H. puniceus,* from which it is to be separated by its *spores,* the yellow base of the stem, the more distinctly adnate gills and the entirely glabrous stem. European authors disagree as to the spore sizes of *H. coccineus* and *H. puniceus,* but two species which agree in the other characters with the published descriptions and figures, and the spores of which are consistently of the two types given under these two species, are found in Michigan. They vary somewhat in size in each case, but the narrower and longer spore of *H. puniceus* is well-marked.

177. Hygrophorus puniceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 52, Fig. 1-5, 1900.
Michael, Führer f. Pilzfreunde, Vol. I, No. 34.
Cooke, Ill., Pl. 922.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 5.
Ricken, Blätterpilze, Pl. 8, Fig. 2.

PILEUS 3-7 cm. broad, campanulate, obtuse, *expanded at length and then wavy or lobed,* bright red or scarlet, *viscid,* fading, glabrous. FLESH fragile, white, yellow under the thin separable pellicle. GILLS *narrowly adnexed,* thick, distant, yellow to scarlet, intervenose, trama of parallel hyphae. STEM 5-8 cm. long, 5-12 mm. thick, ventricose, unequal or tapering, hollow, yellow, or scarlet and yellow, *white at the base,* dry, *fibrillose-striate.* SPORES cylindrical-elliptical, smooth, 9-12 x 4-5 micr. BASIDIA 40-42 x 5-6 micr. ODOR none, TASTE mild.

Gregarious or solitary. On the ground, in moist places, bare ground, woods, thickets, etc. August-October. Ann Arbor, Detroit. Infrequent.

This species is similar to the preceding in general appearance. It is separable from it by its large spores, the slightly adnexed gills and the white base of the stem; it has also a more viscid cap and a somewhat fibrillose stem. It also differs from *H. chlorapanous* in its red colors and dry stem.

Var. *flavéscens* Kauff. (8th Rep. Mich. Acad. of Sci., 1906.)

PILEUS smaller, 2-6 cm. broad, "luteus" yellow, varying to orange tints in places, then citron yellow, fragile, convex-campanulate, expanded, glabrous, even, viscid, sometimes wavy. GILLS adnexed, rather broad, close to sub-distant, *pale yellow or white,* subveiny. STEM 4-7 cm. long, 3-6 mm. thick, hollow, compressed, sulphur or citron-yellow, *base white,* moist, *pellucid-shining, glabrous,* sometimes pellucid-striate. SPORES *smaller,* 6-7.5 x 4-5, elliptical.

Gregarious, in wet places, moss, etc., in cedar swamps or low woods, in northern Michigan. Rather frequent.

The viscidity of the pileus is not very marked. It has much the habit and coloring of *H. chlorophanous,* but the stem is never viscid and varies in color to a distinct citron-yellow with white base, and is usually compressed. It is a distinct species as shown by its spores.

178. Hygrophorus chlorophanus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 329.
Fries, Icones, Pl. 167, Fig. 4.
Cooke, Ill., Pl. 909.
Peck, N. Y. State Mus. Mem. 4, Pl. 51, Fig. 13-20, 1900.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 3.

PILEUS 2-5 cm. broad, convex or campanulate, then nearly plane, obtuse, *viscid,* citron, sulphur or golden yellow, glabrous, sometimes pellucid-striate on margin. FLESH *fragile,* not becoming black when bruised. GILLS *adnexed, ventricose, becoming emarginate, thin,* subdistant, rather broad, pale citron-yellow, trama of parallel hyphae. STEM 3-7 cm. long, 4-8 mm. or less in thickness, *equal* or nearly so, sulphur or pale citron-yellow, *unicolorous,* hol-

low, rarely compressed, *viscid,* glabrous, even. SPORES narrowly elliptical, 6-8 x 4-5 micr., smooth.

Gregarious. Low, moist places in woods. Throughout the state. June-September. Common.

Known by its unicolorous viscid stem, and the adnexed, rather broad gills. The stem often dries quickly when exposed to the wind. Var. *flavescens* of the preceding species is almost as closely allied to this species, but its stem is fundamentally distinct.

179. Hygrophorus marginatus Pk. (Suspected)

N. Y. State Mus. Rep. 28, 1876.

Illustrations: Hard, Mushrooms, Fig. 173, p. 217, 1908.
Plate XXXI of this Report.

PILEUS 1-4 cm. broad, *fragile,* irregularly convex or campanulate, gibbous at times, at length plane, obtuse or broadly umbonate, *hygrophanous,* glabrous, varying *golden yellow to orange or variegated with olivaceous (moist), fading* and pale yellowish (dry), striatulate or rimose on margin. FLESH thin, fragile, concolor. GILLS arcuate adnate, becoming emarginate, subdistant, ventricose, rather broad, deep yellow or orange, *color persisting,* intervenose. STEM 2-5 cm. long, 3-8 mm. thick, fragile, hollow, *dry,* often flexuous or irregularly compressed, glabrous, yellow or tinged orange, *fading* to straw-color. SPORES broadly elliptical, smooth, 7-8 x 4-5 micr. (rarely longer). ODOR and TASTE not marked.

Gregarious or subcaespitose. On the ground in low, moist places in swamps of conifers or in frondose woods. Ann Arbor, Sault Ste. Marie, Marquette, Houghton, Huron Mountains. July-August. Infrequent.

The striking characteristic of this species is the orange-yellow gills which retain their color even after drying, while the pileus and stem fade considerably; this is shown well in Hard's figure. The edge of the gills is sometimes more deeply colored. The whole plant is very fragile, and it is difficult to get good herbarium specimens. The plants found in the Northern Peninsula were mostly variegated with olive, while those in the frondose woods of the south lacked this character, which, however, soon disappears as the pileus fades. None of my specimens were viscid. It is a well-marked species. The stems are sometimes more elongated.

180. Hygrophorus conicus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 166, p. 209, 1908.
White, Conn. State Nat. Hist. Surv., Bull. 3, Pl. 13, p. 34, 1905.
Michael, Führer f. Pilzfreunde, Vol. II, No. 48.
Ricken, Blätterpilze, Pl. 8, Fig. 4.
Cooke, Ill., Pl. 908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 8.
Gillet, Champignons de France, No. 332.

PILEUS 1-3 cm. broad and high, *conical,* unexpanded, subacute at apex, often splitting-expanded, or lobed on margin, viscid when moist, shining when dry, glabrous, yellow, orange or orange-red, subvirgate, *often stained black in age.* FLESH concolor, very thin, becoming black when bruised or old. GILLS almost *free,* ventricose, broad, almost triangular at times, thick, rather close to subdistant, pallid to sulphur-yellow, when old black stained, trama of parallel hyphae. STEM 3-9 cm. long, 2-6 mm. thick, subcylindrical, soft, *dry, fibrillose-striate,* usually *twisted,* hollow, citron to golden yellow, *becoming black stained with age,* splitting longitudinally. SPORES broadly elliptical, 8-10 x 5-6.5 micr., smooth. CYSTIDIA none. BASIDIA 35-38 x 8 micr., slender.

Gregarious or solitary. In low, moist, conifer or frondose woods, grassy places, etc. Throughout the State. May to October. (Earliest record May 8; latest October 15.) Very common.

Easily recognized by its conical pileus and the blackening flesh. The whole plant usually turns black in drying. It is not unusual to find olive tints in the pileus, and the shades of yellow or orange to red vary much as the plant matures or ages. After having become rain-soaked, the whole plant is sometimes black.

181. Hygrophorus nitidus B. & C. (Non. Fr.)

Centuries of N. Amer. Fungi (Exsicatti), see also Peck, N. Y. State Mus. Rep. 23, 1870.

Illustrations: Peck, N. Y. State Mus. Bull. 94, Pl. 88, Fig. 1-7, 1905.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 6.

PILEUS 1-2.5 cm. broad, fragile, convex, *umbilicate,* viscid when

moist, *wax-yellow to lemon-yellow, whitish when dry, pellucid*-striatulate and shining when moist, glabrous. GILLS arcuate, decurrent, distant, pale yellow, intervenose. STEM 3-7 cm. long, 2-4 mm. thick, *slender,* fragile, hollow, equal or narrowed downwards, sometimes flexuous, *viscid* at first, wax-yellow, at length whitish. SPORES elliptical, 6-7 x 3-4 micr. ODOR and TASTE not marked.

Gregarious or subcaespitose. On the ground in swamps or low woods in the conifer regions of the State. Marquette, Houghton, Huron Mountains, New Richmond. July to September. Frequent locally.

A slender Hygrophorus whose cap and often also the stem, fade considerably on drying. This characteristic distinguishes it from *H. ceraceus.* It has hitherto been found only in mixed woods of hemlock, birch and maple or of maple and oak in the northern and western parts of the state. The gills are usually quite decurrent, narrowed to a point on the stem, and their persistent color contrasts markedly with that of the stem and pileus as the plant dries. There is no universal viscous veil as in the plant of the same name described by Fries. The latter plant is now called *H. friesii* Sacc.

182. Hygrophorus laetus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 8, Fig. 8.
Fries, Icones, Pl. 167, Fig. 2.
Cooke, Ill., Pl. 938.
Gillet, Champignons de France, No. 338.

"PILEUS 1.5-3 cm. broad, convex-plane, *subobtuse,* viscid when moist, shining, *tawny, not fading,* pellucid-striate. FLESH concolor or paler, *tough,* thin. GILLS subdecurrent, broadly adnate, subtriangular, distant, thin, yellow, greenish-yellow, grayish-yellow or at length pale orange. STEM slender, 3-5 cm. long, 3-6 mm. thick, *tough,* glabrous, *very viscid,* equal, *tawny,* undulate-uneven. SPORES elliptical, 6-7 x 4 micr. BASIDIA 30 x 5-6 micr. ODOR and TASTE not marked."

Gregarious. In meadows, pastures, cedar swamps, etc. Lewiston, Houghton. July-August. I have given Ricken's description. Doubtless it is often confused with *H. peckii.* The dry state of the latter seems to imitate it, and differs only in its fragility, the subumbilicate pileus, and gills which are at first whitish.

183. Hygrophorus peckii Atk.

Jour. of Mycol., Vol. 8, 1902.

PILEUS 1-2 cm. broad, fragile, convex-plane, *broadly umbilicate* or depressed, glutinous when moist, color varying pale yellowish-flesh color, *pinkish or vinaceous-buff*, rarely tinged greenish, glabrous, pellucid-striatulate when moist, fading somewhat on drying. GILLS arcuate-decurrent, distant, rather broad, whitish to pale flesh color, trama of parallel hyphae. STEM 3-8 cm. long, 2-4 mm. thick, slender, equal, *very viscid,* shining, concolor, rarely greenish at apex, hollow, terete, even. SPORES broadly elliptical, 6-8 x 5 micr. ODOR present or absent; taste mild.

Gregarious or solitary. On the ground, moss, etc., of low, wet woods or swamps of cedar and balsam in northern Michigan, maple and oak woods of the southern part of the State. Isle Royale, Marquette, New Richmond, Ann Arbor, etc. July-August, rarely September. Frequent.

This is much more common apparently than *H. lactus,* and may represent an American variety of that species. It differs from *H. psitticinus* by the form of the pileus; in that species it is obtuse or umbonate, and the green color persists longer and is practically always present in the young plant, while in *H. peckii* the green tinge is rare. Both these species are very slippery on the stem and cap when fresh or young.

184. Hygrophorus psitticinus Fr.

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 8, Fig. 6.
Michael, Führer f. Pilzfreunde, No. 65.
Swanton, Fungi, Pl. 9, Fig. 7-8, 1909.
Cooke, Ill., Pl. 910.
Gillet, Champignons de France, No. 346.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 4.

PILEUS 1-3 cm. broad, *campanulate*, then convex-expanded or plane, *umbonate or obtuse*, glutinous and slippery, *at first parrot-green,* at length varying livid-reddish, pinkish-flesh color or dingy citron-yellowish, pellucid-striate. FLESH thin, subconcolor. GILLS adnate, ventricose, thick, subdistant, greenish or incarnate-reddish to yellowish, intervenose, trama of parallel hyphae. STEM

4-7 cm. long, 2-5 mm. thick, equal, *toughish,* even, *very viscid* when fresh, glabrous, undulate-uneven, subpellucid, *green above,* usually tinged reddish-orange, flesh-colored or yellowish elsewhere, hollow. SPORES short elliptical, smooth 6-7.5 x 4-5 micr. BASIDIA slender, 36-40 x 5-6 micr.

Gregarious or subcaespitose. On the ground in low, mossy woods or swamps, or in grassy places. Marquette, Houghton, New Richmond, Detroit, Ann Arbor. Throughout the State. July-October. Rather frequent.

This striking species is one of the few bright green mushrooms. As in the case of *Stropharia aeruginosa* and *Pholiota aeruginosa,* it is always a delight to come across this beautiful little plant. The green color soon fades out when exposed to the wind and light, whereas those individuals which are protected by leaves, etc., retain this color for some time. There is no cortina in the young stage, and the gluten is derived from the cuticle of the pileus and stem; otherwise, except for the structure of the gill-trama, it might be confused with the subgenus Limacium. Its colors are sufficiently characteristic in the early stage to prevent anyone from confusing it with other Hygrophori.

185. Hygrophorus unquinosus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 924.
Gillet, Champignons de France, No. 350.

PILEUS 2-5 cm. broad, fragile, hemispherical-campanulate, then subexpanded, obtuse, *gray or smoky brown, glabrous,* pellucid striate, *very viscid,* radiate-wrinkled in age. FLESH pallid, thin, very fragile. GILLS broadly adnate, subventricose, *pure white,* thickish, subdistant. STEM 3-8 cm. long, 3-8 mm. thick, subequal or variously thickened, hollow, compressed, *viscid-slippery,* glabrous, *lead-gray.* SPORES elliptical, 7-8 x 4-5 micr. BASIDIA 30-35 x 5-6 micr. Trama of gills parallel. ODOR none when young. TASTE mild.

Gregarious or subcaespitose. On the ground or moss of low woods or swamps. Detroit, Marquette, Houghton. July-September. Rather rare.

This species must not be confused with *H. fuligineus* which belongs to the subgenus Limacium, and has a solid stem and a veil.

AGARICEÆ

Context of fruit-body fleshy, putrescent, that of pileus sometimes membranous, of stem sometimes cartilaginous or horny; neither leathery, nor vesiculose. Stem central, eccentric, lateral or lacking. Gills well-developed, acute on edge. Spores with a hyaline or colored epispore: their deposit in mass on white paper yields a series of "prints" of various shades of white, pink, ochraceous, brown, purple or black. This series is arbitrarily divided into five artificial groups as follows:

(a) Black-spored. (*Melanosporae*): Spore-print black.

(b) Purple-brown-spored. (*Amaurosporae*): Spore-print dark purple or purple-brown.

(c) Rusty-spored or ochre-spored. *(Ochrosporae):* Spore-print rusty-yellow, rusty-brown, ochraceous or cinnamon-brown.

(d) Pink-spored. *(Rhodosporae):* Spore-print flesh-colored, rosy or pale pink.

(e) White-spored. *(Leucosporae):* Spore-print white.

The spore-print is in many cases indispensable in determining the proper group to which the mushroom belongs. It is obtained easily by cutting off the stem just below the gills and laying the cap, with gills down, on a piece of white paper and covering it over night with a dish to prevent premature drying. Mushrooms which have been kept on ice do not seem to deposit spores thereafter, nevertheless it is well to avoid too warm a place, else the specimen may putrefy. The color of the spores may often be detected at the time of collecting by the deposit already made on the ground beneath it or on other mushrooms when growing in a cluster. In mature specimens the gills usually become colored by the color of the spores, but when young the gills are generally white; in some species, however, the gills are themselves colored, e. g., *Clitocybe illudens* and *Mycena leijana*. After some experience, it is usually possible to determine the group to which a species belongs by means of the microscope. The delicate tint of the color for each group is then discernible in the epispore of each mature spore. This method is especially useful in cases where it is a question of the presence of the purple tint of the purple-brown-spored plants; the spore-mass or gills often appear entirely dark brown to the naked eye in species whose separate spores have a purple tint under the microscope.

MELANOSPORAE

Coprinus Pers.

(PROF. L. H. PENNINGTON)

(From the Greek, *kopros,* dung.)

Spores dark brown or black; gills free or slightly attached, *at first closely in contact laterally,* separated in many cases by projecting cystidia, soon deliquescing, or drying quickly to a black line upon the lower side of pileus. Many small species develop at night and almost entirely disappear by morning. The flesh of the pileus is thin, in the smaller species often membranaceous or apparently lacking entirely. A universal veil is present in a majority of the species. The stem is fleshy to fibrous. Most of the species grow upon dung or richly manured ground, several upon wood or vegetable debris, and a few upon lawns, sand, or even upon walls in cellars.

The spores of the dung inhabiting species usually germinate readily to produce a fine white or colorless mycelium upon which sporophores will often appear within 7-10 days after the spores are sown. *C. radiatus,* various forms of *C. ephemerus, C. patouillardi, C. semilanatus, C. narcoticus* and several similar kinds are readily grown in pure cultures in the laboratory. *C. sclerotigenous* grows from rather small black sclerotia in dung or in a mixture of soil and dung. Some of the wood inhabiting species, *C. laniger* and *C. radians* are often found growing from dense masses of fine yellow mycelial threads, called *ozonium.* Others, e. g. *C. quadrifidus,* grow from tough coarse black fibres, termed *rhizomorphs.* The pileus is scaly from the breaking up of the cuticle into rather large squamose scales in the Comati; into fine innate fibrils in the Atramentarii; smooth but covered at first with floccose, mealy or granular scales, which wholly or partly disappear in the Picacei and Tomentosi; or pruinose with minute hairs in forms of *C. ephemerus* and *C. radiatus.* The stem is stuffed or hollow, fleshy or fleshy-fibrous, often very fragile. It differs in texture from the trama of the pileus and usually separates easily from it. The gills are white at first. In some species they become purplish then black, in others they become brown or smoky, then black. They are free or slightly attached, or adnate in a few species.

The universal veil is usually seen as scales, fibrils or granules at

the base of the stem or upon the pileus. In a few instances it forms a movable ring upon the stem in *C. comatus, C. bulbilosus* and frequently in *C. sterquilinus;* in the last named species the veil may form a distinct volva at the base of the stem. The taste is mild and the odor is usually pleasant. A few species, as *C. quadrifidus* and *C. narcoticus*, have a strong disagreeable odor. None of the species of Coprinus are considered poisonous and many are highly esteemed by the mycophagist.

The spores are very dark brown or sooty black in mass. By transmitted light they vary from light brown to very dark brown or smoky black. There is a wide variation in the size and shape of the spores. Some species may be identified by the spores alone as *C. insignis, C. boudieri* and some forms of *C. ephemerus,* etc.

The genus can be divided into two fairly distinct groups (see Massee, Ann. Bot., Vol. 10, p. 123, 1896) according to the size of the plant and the thickness of flesh or cuticle covering the gills; these groups can be further subdivided into sections as follows:

A. Pelliculosi:
- I. Comati
- II. Atramentarii
- III. Picacei
- IV. Tomentosi
- V. Micacei
- VI. Glabrati (No species reported)

B. Veliformes:
- VII. Cyclodei
- VIII. Lanulati
- IX. Furfurelli
- X. Hemerobii

Key to the Species

(A) Plants large, usually over 3 cm. broad; pileus fleshy or sub-fleshy.
- (a) Pileus with cuticle torn into distinct scales or almost smooth.
  - (b) Cuticle torn into distinct scales; ring or volva present.
    - (c) Spores over 20 micr. long; volva usually evident. 188. *C. sterquilinus* Fr.
    - (cc) Spores less than 20 micr. long; movable ring usually present upon stem.
      - (d) Pileus cylindrical; spores 15-17 micr. long. 186. *C. comatus* Fr.
      - (dd) Pileus ovate; spores less than 15 micr. long. 187. *C. ovatus* Fr.
  - (bb) Pileus smooth or with innate fibrils.
    - (c) Spores smooth, plants usually densely caespitose. 189. *C. atramentarius* Fr.
    - (cc) Spores distinctly warted. 190. *C. insignis* Pk.

(aa) Cuticle not torn into scales; veil breaking up into superficial patches, scales, or granules.

(b) Veil felt-like, breaking up into areolate patches.
(c) Rhizomorph or ozonium not evident; plants densely caespitose. 192. *C. ebulbosus* Pk.
(cc) Rhizomorph or ozonium present.
(d) Plants growing from rhizomorph; 5-8 cm. broad. 191. *C. quadrifidus* Pk.
(dd) Plants growing from fine yellow ozonium; 1-3 cm. broad. 193. *C. laniger* Pk.
(bb) Veil not as above.
(c) Veil of fibrillose scales or a dense coat of white mealy vesicles.
(d) Spores less than 10 micr. long.
(e) Gills broad; growing upon sand. 199. *C. arenatus* Pk.
(ee) Gills narrow.
(f) Disk livid; upon rotten wood in forest. 197. *C. lagopides* Karst.
(ff) Disk buff; upon cellar walls. 198. *C. jonesii* Pk.
(dd) Spores more than 10 micr. long.
(e) Gills attached.
(f) Disk obtuse; reddish or reddish brown. 202. *C. domesticus* Fr.
(ff) Disk narrow, not colored; veil often composed of mealy vesicles. 200. *C. niveus* Fr.
(ee) Gills free.
(f) Pileus at first cylindrical. 196. *C. tomentosus* Fr.
(ff) Pileus not cylindrical.
(g) Veil more or less mealy; plants small, not in troops.
(h) Spores 11-13 micr. long. 201. *C. semilanatus* Pk.
(hh) Spores 15-17 micr. long. 200. *C. niveus* Fr.
(gg) Veil never mealy; plants large; in troops upon dung heaps.
(h) Stem not rooting. 194. *C. fimetarius* Fr.
(hh) Stem rooting. 195. *C. fimetarius* var. *macrorhizus* Fr.
(cc) Veil of small granules or micaceus particles.
(d) Spores less than 10 micr. long.
(e) Plants not growing from ozonium; densely caespitose. 203. *C. micaceus* Fr.
(ee) Plants from ozonium or at least with radiating mycelium at base of stem, single or caespitose. 204. *C. radians* Fr.
(dd) Spores 10-12 micr. long. 209. *C. micaceus* var. *conicus* Pk.
(AA) Pileus thin, plicate; if subfleshy then less than 3 cm. broad when expanded.
(a) Veil present as superficial scales or granules.
(b) Ring present upon the stem. 205. *C. bulbilosus* Pat.
(bb) Ring absent.
(c) Pileus covered with a dense white floccose or mealy coat.
(d) Spores 12 micr. or more long.
(e) Spores 12-13 micr. long. 201. *C. semilanatus* Pk.
(ee) Spores 15-16 micr. long. 200. *C. niveus* Fr.
(dd) Spores less than 12 micr. long.
(e) Plants growing from black sclerotia in dung. 207. *C. sclerotigenous* E. & E.
(ee) Not growing from sclerotia.
(f) Plants growing upon plant stems. 209. *C. brassicae* Pk.
(ff) Plants growing upon dung or soil.
(g) Odor strong; spores 10-11 micr. long. 208. *C. narcoticus* Fr.
(gg) Little or no odor; spores 6-8 micr. long. 206. *C. stercorarius*.
(cc) Pileus with a few micaceus particles or granules.
(d) Spores ovate triangular or pentagonal, compressed. 210. *C. patouillardi* Quel.
(dd) Spores elliptical. 211. *C. radiatus* Fr.

(aa) No veil present.
(b) Spores angular.
(c) Spores key-stone shaped; plants growing upon ground in woods. 214. *C. boudieri* Quel.
(cc) Spores not key-stone shaped; plants upon dung. 213. *C. ephemerus* Fr. form.
(bb) Spores not angular.
(c) Plants growing upon dung or recently manured ground. 213. *C. ephemerus* Fr.
(cc) Not growing upon dung.
(d) Growing among grass; spores broadly ovate, compressed. 215. *C. plicatilis* Fr.
(dd) Growing in woods; spores gibbous-ovate. 213. *C. silvaticus* Pk.

PELLICULOSI. Pileus covered with a distinct fleshy or membranous cuticle, not splitting along the lines of the gills but becoming lacerate and revolute. Plants usually large.

Section I. *Comati.* Ring formed from the free margin of the volva; cuticle torn into scales.

186. Coprinus comatus Fr. (Edible)

(The Shaggy-Mane)

Fries, Epicr., p. 242.

Illustrations: Cooke, Ill., Pl. 658.
Murrill, Mycologia, Vol. 1, Pl. 3, Fig. 3.
Atkinson, Mushrooms, Fig. 31-38.
Hard, Mushrooms, Figs. 269, 270.
Gillet, Champignons de France, No. 174.
Patouillard, Tab. Analyt., No. 448.

PILEUS 7-10 cm. high, cylindrical, then more or less expanded, at first even, the cuticle becoming torn into broad adpressed scales, pale ochraceous, becoming darker in age, interstices whitish. GILLS up to 12 mm. broad, almost free, white, crowded, then pinkish, at length black. STEM 10-15 cm. long, 12-17 mm. thick, subequal, slightly attenuated upwards, white, even, hollow, more or less bulbous, bulb solid, ring movable. SPORES almost black, elliptical, 13-18 x 7-8 micr.

Gregarious. In lawns and fields, very common in autumn, occasional in spring.

The Shaggy Mane is probably more generally used for food than any other Coprinus. By many people, however, it is not considered equal in quality to *Coprinus micaceus.*

187. Coprinus ovatus Fr. (Edible)

Fries, Epicr., p. 242.

Illustrations: Schaeffer, Icon., Tab. 7.
Cooke, Ill., Pl. 659.

PILEUS about 5 cm. across when expanded, at first ovate and covered with an even pale ochraceous cuticle, which becomes broken into large concentric scales, the apical portion remaining intact like a cap, margin striate. FLESH, thin, white. GILLS about 4 mm. broad, free, distant from the stem, whitish then black. STEM 6-10 cm. long, 10 mm. thick, attenuated upwards, flocculose or fibrillose, white, hollow, the lower portion bulbous, solid, rooting, ring evanescent. SPORES smoky black, 11-12 x 7-8 micr.

This plant, which is often considered as a smaller form of *Coprinus comatus* Fr., was found but once growing upon a lawn at Palmyra, Mich. It differs from *Coprinus comatus* Fr. in that it has a smaller ovate pileus and smaller spores. In the specimens found the pileus was about 3 cm. high and the spores 11-13 x 7 mm. But for its much smaller spores the plant might easily be taken for a form of *Coprinus sterquilinus* growing in soil. In shape and color the spores of *Coprinus comatus, C. ovatus* and *C. sterquilinus* are very similar. In size, however, there is much variation, the measurements running from 11 microns in *C. ovatus* to 26 microns in *C. sterquilinus.*

188. Coprinus sterquilinus Fr. (Edible)

Fries, Epicr., p. 242.

Illustrations: Patouillard, Tab. Analyt., No. 437.
Gillet, Champignons de France, Pl. 130 (as *C. oblectus* Fr.).
Cooke, Ill., Pl. 660.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 3.
Plate XXXII of this Report.

PILEUS 5-6 cm. broad when expanded, at first short cylindrical, conical then expanded, white tinged with brown or fuscous at disk, cuticle at first villous or silky, later torn into squarrose scales especially at disk. FLESH thin, white, sulcate half way to disk. GILLS free, white then purplish, soon becoming black. STEM 10-15 cm. high, slightly attenuated upward, subfibrillose, white slowly becoming discolored when bruised, often entirely black with spores.

hollow, base solid, thickened, peronate, the sheath or volva with a free margin. SPORES 18-25 micr., smoky black.

In old manure, straw, or in manured ground. June.

This plant has been reported as *Coprinus stenocoleus* Lindb. It is also *Coprinus macrosporus* Pk. When growing in manured ground, the volva is not as evident as when the plant grows in old manure or straw. From plates and descriptions it appears that this plant has also been called *Coprinus oblectus* Fr. In the herbarium of the New York Botanical Garden a specimen from Kew labeled *Coprinus oblectus* Fr. is very plainly *Coprinus sterquilinus* Fr. Moreover in a collection of many individuals, specimens may be picked out which fit the description of *C. sterquilinus, C. stenocoleus, C. oblectus* and *C. macrosporus* respectively. It is very probable that these names are all synonyms.

The plants are frequently found in June upon old manure which has been lying out in the open over winter or in heavily manured ground. The young unexpanded plants resemble rather small short specimens of *C. comatus* Fr. Undoubtedly *C. sterquilinus* Fr. is frequently taken for *C. comatus* or *C. ovatus*. In fact the writer has had typical specimens of *C. sterquilinus* pointed out to him by a mushroom collector as "the shaggy mane mushroom, very good to eat."

The gills sometimes remain perfectly white for several hours and then change rapidly through a purplish color to a smoky black. The flesh is thin and, as the pileus expands, it often becomes revolute and in bright sunshine it dries in this condition. Sometimes the stem becomes dark when bruised or when dried. Usually, however, it remains white unless it becomes covered with spores.

This mushroom is edible and has a more pronounced "mushroom" flavor than the ordinary Coprinus. McIlvaine says, *"Coprinus macrosporus* is an excellent species, higher in flavor than any other Coprinus."

Section II. Atramentarii. Ring imperfect, not volvate, squamules of pileus minute, innate.

189. Coprinus atramentarius Fr. (Edible)

Fries, Epicr., p. 243.

Illustrations: Cooke, Ill., Pl. 622.
Gillet, Champignons de France, No. 172.
Atkinson, Mushrooms, Fig. 39-42.
Hard, Mushrooms, Fig. 271-272.
Murrill, Mycolgia, Vol. 1, Pl. 3, Fig. 4.

PILEUS 5-8 cm. broad when expanded, ovate then expanded, firm, often lobed and plicate, grayish, silky fibrous, or minutely mealy, apex brownish, often minutely squamulose. FLESH thin. GILLS crowded, broad, ventricose, free, white then black, often with a purplish tinge. STEM 10-15 cm. high by 1-2 cm. thick, white, silky shining, hollow, ring basal, very evanescent. SPORES 11-12 x 5.5-6 micr. CYSTIDIA numerous, large, subcylindrical.

Common, gregarious or densely caespitose, about stumps or on rich soil, but not upon dung.

Both the smooth and the scaly, or squamulose, forms are found. These characters often seem to depend upon weather conditions, the smooth form being found under moist atmospheric conditions and the scaly form under dry atmospheric conditions.

Its close broad gills make it very thick and meaty in the unexpanded condition. For this reason some people consider this species the most desirable Coprinus for the table.

190. Coprinus insignis Pk.

Peck, N. Y. State Mus. Rep. 26, p. 60, 1874.

Illustration: Plate XXXIII of this Report.

PILEUS 5-7.5 cm. broad, ovate then campanulate, thin, sulcate-striate to the disk, grayish brown, glabrous or with a few innate fibrils, disk sometimes cracking into small areas or scales. GILLS free, ascending, crowded. STEM 10-14 cm. high, 10 mm. thick, hollow, slightly fibrillose, striate, white. SPORES 10 x 7 micr., rough.

About trees in woods.

This plant was found but twice in low woods at Ann Arbor. It resembles *C. atramentarius* in some respects but differs very decidedly in the distinctly warted spores.

Section III. Picacei. Universal veil flocculose, at first continuous, then torn into superficial areolate patches by the expansion of the pileus.

191. Coprinus quadrifidus Pk.

N. Y. State Mus. Rep. 50, p. 106, 1897.

Illustration: Plate XXXIV of this Report.

PILEUS 5-8 cm. broad, oval then campanulate, finally more or less expanded, thin, margin becoming revolute; covered at first with a floccose-tomentose veil, which soon breaks into evanescent flakes or scales and reveals the finely striate surface of the pileus; whitish, becoming gray or grayish brown with age; margin often wavy or irregular. GILLS broad, thin, crowded, free, at first whitish, then dark purplish brown, finally black. STEM 7-10 cm. long by 6-8 mm. thick, equal or slightly tapering upward, hollow, white, floccose-squamose, sometimes with an evanescent ring at the base. SPORES 7.5-10 x 4-5 micr.

Gregarious or caespitose upon or near decaying stumps or logs, growing from an abundant rhizomorph. Ann Arbor, Bay View.

Although nothing is said in the original description about the rhizomorph, some few strands may be seen at the base of the stem in some of the type specimens. The writer has found this plant growing in New York from richly developed rhizomorph upon the roots and trunk of dead basswood.

192. Coprinus ebulbosus Pk.

Bull. Torr. Bot. Cl. 22, 1895.

Illustrations: Hard, Mushrooms, Fig. 274.
Plates XXXV and XXXVI of this Report.

PILEUS 5-7 cm. broad, thin, campanulate, somewhat striate, grayish brown, margin at length revolute, lacerated, cuticle breaking into broad superficial persistent whitish scales. GILLS narrow, thin, crowded, free, slate-colored becoming black. STIPE 7-15 cm. long, 10-15 mm. thick, equal, hollow, white. SPORES 7.5-10 x 5 micr., elliptical.

Caespitose near or upon decaying trees or stumps.

193. Coprinus laniger Pk.

Bull. Torr. Bot. Cl. 22, 491, 1895.

Illustration: Plate XXXVII of this Report.

PILEUS 12-25 mm. broad, thin, conical or campanulate, pallid, tawny or grayish-ochraceous, sulcate-striate, covered with tawny, tomentose or floccose scales, which wholly or partly disappear. GILLS crowded, whitish, then brownish black. STEM 2.5 cm. long, 2-4 mm. thick, slightly thickened at base, hollow, white, pruinose. SPORES 7-10 x 4 micr., oblong-elliptical.

Caespitose or gregarious upon or near decaying wood. Unfortunately the type specimens of this species have been lost. The plants referred to this species are found growing from a more or less profusely developed yellow ozonium upon various kinds of decaying wood.

The three species *C. laniger, C. ebulbosus* and *C. quadrifidus,* seem to be distinct forms in a perplexing group of brown-spored wood-inhabiting Coprini, which are as yet very imperfectly known. *C. laniger* is smaller than either of the others and we have always found it associated with the fine strands of yellow ozonium. It resembles *C. radians,* but it has a thicker veil, which breaks into evident patches instead of minute particles as in *C. radians.*

C. quadrifidus and *C. ebulbosus* are not readily distinguished and may both prove to be the species which have been known as *C. flocculosus* (DC) Fr. or *C.* (*Agaricus*) *domesticus* Bolt.

Section IV. Tomentosi. Universal veil a loose villose web which becomes torn into distinct floccose scales.

194. Coprinus fimetarius Fr.

Fries, Epicr., p. 245.

Illustration: Plate XXXVIII of this Report.

PILEUS 2.5-5 cm. across, clavate then conico-expanded, soon split and revolute, grayish, apex tinged with brown, at first covered with white floccose scales, then naked, rimose-sulcate; disk even, flesh thin. GILLS free, lanceolate, becoming linear and wavy, very early becoming black with spores and rapidly deliquescing. STEM 12-15 cm. long, 4-6 mm. thick, hollow, thickened at the solid base,

white, squamulose. SPORES 12-14 x 7-8 micr. CYSTIDIA large and numerous.

Solitary or in troops. Common upon dung heaps. The clavate caps already dark with spores may be found emerging late in the afternoon or in the evening. In the morning there will be little remaining except a small mass of inky fluid at the apices of the stems.

195. Coprinus fimetarius var. macrorhiza Fr.

Fries, Hym. Eur., p. 324.

Illustrations: Cooke, Ill., Pl. 670.
Massee, Ann. Bot., Vol. 10, Pl. X, Fig. 1.
Hard, Mushrooms, Fig. 275.
Gillet, Champignons de France, No. 178.

PILEUS at first with feathery squamules which become more or less squarrose, especially at the disk where they often form a crown. STEM short, villous, often sub-bulbous and with a more or less elongated base.

The type and this variety are very common, the latter being rather more frequently found than the former. In moist weather they may be found in almost any dung heap, a fresh troop appearing each evening and disappearing early the following day. There seems to be considerable variation in size, length of root and character of scales. In the typical form the root is usually reduced to a rather indefinite mass of hyphae, while the scales are more or less squarrose over the entire surface. In the variety the veil is more silky and closely appressed to the pileus, later becoming squarrose at the disk forming a crown of scales.

196. Coprinus tomentosus Fr.

Fries, Epicr., p. 246.

Illustration: Bulliard, t. 138.

PILEUS 2.5-4 cm. long, sub-membranaceous, cylindrical, narrowly conical, then expanding and splitting, striate, floccose-tomentose, pale gray, the floccose veil becoming torn into more or less persistent flakes or patches upon the expanded pileus. GILLS free, narrow. STEM 5-7 cm. long, 4-5 mm. thick, equal or slightly enlarged below, hollow, velvety, white or grayish. SPORES 12-13 x 7-8 micr., elliptical.

Solitary or gregarious upon dung or various kinds of debris. This is one of the earliest species of Coprinus to appear in the spring. The long cylindrical or narrowly conical pileus distinguishes this plant from the various forms of *C. fimetarius,* which usually appear a little later in the season.

This may be the *C. lagopus* of various authors.

197. Coprinus lagopides Karst.

Karsten, Hatts., 1, 535.

Illustrations: Massee, Ann. Bot., Vol. 10, Pl. 10, Figs. 20-22.

PILEUS 4-7 cm. broad, very thin, campanulate, sulcate, grayish, disk livid, ornamented with free white scales joined by hairs. GILLS subcrowded, narrow, remote, black. STEM up to 17 cm. high, white, floccose, hollow, equal. SPORES 6-8 x 5-6 micr., apiculate. Upon very rotten wood in forest.

Found once at Bay View. We have found this plant in New York also.

198. Coprinus jonesii Pk.

Peck, Bull. Torr. Bot. Club 22, p. 206, 1895.

PILEUS 2.5-5 cm. broad, at first blunt, or truncate, becoming campanulate or broadly convex, submembranaceous, grayish, buff at apex, covered at first with white or tawny-cinereous floccose scales which wholly or partly disappear with age, striate, margin revolute and splitting. GILLS crowded, linear, free, whitish, becoming black. STEM 5-9 cm. long, 4-7 mm. thick, equal or slightly tapering upward, minutely floccose, hollow, white. SPORES 7.5-8.5 x 6 micr., broadly elliptical.

Fragile, sometimes caespitose. Found upon the wall in a cellar at Ann Arbor. Peck says "This species is closely related to *C. fimetarius* of which it might easily be considered a variety, but it is easily distinguished by the truncate apex of the young pileus, the differently colored pileus and smaller spores." It grew on what appeared like uncracked hard and dry plaster of the wall.

199. Coprinus arenatus Pk.

Peck, N. Y. State Mus. Rep. 46, p. 107, 1892.

PILEUS 2.5-5 cm. broad, thin, at first broadly ovate or subhemispherical, soon convex or campanulate, adorned with small white tomentose scales, striate on the margin, whitish or grayish-white, becoming grayish-brown with age, reddish brown in dried plant. GILLS crowded, broad, free, grayish-white, soon purplish-brown, finally black, furnished with numerous cystidia. STEM 2.5-5 cm. long, 2-4 mm. thick, equal, glabrous, hollow, white. SPORES 7.5-9 x 6-7.5 micr., broadly ovate or subglobose, purplish brown by transmitted light.

Solitary or gregarious in sandy soil, Ann Arbor. The mycelium binds the sand together in balls at the base of the stem.

200. Coprinus niveus Fr.

Fries, Epicr., p. 246.

Illustration: Cooke, Ill., Pl. 673 B.

PILEUS 1.5-2.5 cm. across, elliptical then campanulate and expanded, submembranaceous, almost persistently covered with snow-white floccose down. GILLS slightly attached, narrow, becoming blackish. STEM 4-8 cm. high, subequal or slightly attenuated upwards, villose, white, hollow. SPORES 16 x 11-13 micr.

This plant is frequently found upon dung heaps, street sweepings or in recently manured ground. Upon the pileus the veil is of a mealy nature but the tomentose character shows at the margin of the pileus and upon the stem. The spores are somewhat flattened, measuring 15-17 x 11 to 13 x 8-10 micr.

The plant referred to this species is *C. stercorarius* (Bull.) Fr. and has been distributed under that name in Sydow Mycotheca Marihoa, No. 2101.

201. Coprinus semilanatus Pk.

N. Y. State Mus. Rep. 24, p. 71, 1872.

Illustrations: N. Y. State Museum Report 24, Pl. 4, Fig. 15-18.

PILEUS 2-2.5 cm. broad, convex then expanded and revolute, sometimes split, submembranaceous, finely and obscurely rimose-

striate, farinaceo-atomaceous, white, then pale grayish-brown. GILLS narrow, close, free. STEM 10-15 cm. high, slightly tapering upward, fragile, hollow, white, the lower half clothed with loose cottony flocci which rub off easily, upper half smooth or slightly farinaceous. SPORES 12.5 micr., broadly elliptical. Rich ground and dung.

This plant is frequently found on cow dung in woods and shaded pastures. It resembles *C. niveus* Fr. but differs from it in its smaller size, free gills and constantly smaller spores. The spores in both species are broadly elliptical and somewhat flattened. This fungus grows readily from spores in laboratory cultures.

202. Coprinus domesticus Fr.

Fries, Epicr., p. 251.

Illustrations: Cooke, Ill., Pl. 684.
Gillet, Champignons de France, No. 176.
Plate XXXVIII of this Report.

PILEUS, 3-5 cm. across, thin, ovate, then campanulate, obtuse, furfuraceous, squamulose, pale grayish-white, disk brown or reddish brown, undulate, sulcate, splitting. GILLS adnexed, crowded, narrow at first, reddish white then blackish brown. STEM 5-7 cm. long, 4-6 mm. thick, slightly attenuated upwards, subsilky, white, hollow. SPORES 14-16 x 7-8 micr.

Usually caespitose, on various kinds of vegetable debris, sometimes in gardens where rubbish has been plowed under.

Section V. Micacei. Pileus at first covered with more or less micaceous squamules or granules, which soon wholly or partly disappear.

203. Coprinus micaceus Fr. (Edible)

Fries, Epicr., p. 247.

Illustrations: Cooke, Ill., Pl. 673.
Atkinson, Mushrooms, p. 44, Figs. 43, 44.
Murrill, Mycologia, Vol. 1, Pl. 3, Fig. 5.
Hard, Mushrooms, Fig. 273.
Plates XXXIX and XL of this Report.

PILEUS 4-6 cm. across, submembranaceous, elliptical then cam-

panulate, coarsely striate, disk even, margin usually more or less repand, ochraceous-tan, disk darker, when young densely covered with minute glistening particles which usually soon disappear. GILLS sub-crowded, lanceolate, adnexed, whitish, then brown, finally nearly black. STEM 5-7 cm. long, 4-6 mm. thick, equal, even, hollow, silky white. SPORES 7-8 x 4-5 micr., dark brown in mass.

Very common, generally densely caespitose about stumps or trees, or growing from decaying wood buried in the earth. Under favorable conditions this Coprinus may be found from early spring until late autumn. It often appears at intervals of one to two weeks in the same place for a considerable length of time and it may be found year after year in the same place. It has a good flavor and is considered by many the best Coprinus for the table.

C. micaceus var. *conicus* Pk. (Not published.)

This variety differs from the type in having a distinctly conical pileus, darker colored, larger spores, 10-12 micr. long. It was found once at Palmyra, Michigan.

204. Coprinus radians (Desm) Fr.

Fries, Epicr.,' p. 248.

Illustrations: Cooke, Ill., Pl. 676 a.
Lloyd, Mycological Notes, Vol. 1, p. 146, Fig. 69.
Massee, Ann. Bot., Vol. 10, Pl. X, Figs. 6-8.

PILEUS 2-5 cm. across, ovate, conical or campanulate, yellowish-fulvous, soon becoming paler especially at the margin, striate to disk, covered with small brown granules which are more numerous at the disk. GILLS rather narrow, attached, pale then brownish black. STEM 3-6 cm. long, 2-3 mm. thick, equal or slightly swollen at base, hollow, white, smooth or minutely mealy at first, more or less evident yellow or white strands of mycelium radiating from the base. SPORES 7 x 4 micr., elliptical, brownish black.

Rather common, single or sub-caespitose, upon wood, rubbish, etc., or even in humus, sometimes growing from dense masses of yellow ozonium.

This is the plant illustrated by Lloyd and determined by Patouillard as *C. radians* (Desm.) Fr. It is also *C. pulchrifolius* Pk. It is possible also that it may be *C. granulosus* Clements. *C. radians*

as figured by Cooke and Massee always has yellowish brown mycelium radiating from the base of the stem. Saccardo, Syll., Vol. 5, p. 1092, says that in Italy this plant grows upon *Ozonium stuposum* Fr. The writer has sometimes found our plant growing from masses of yellow ozonium, upon decaying maple, black locust and black ash logs. It appeared once in our laboratory cultures upon mycelium which was white at first then gradually became yellowish brown. This is not the only Coprinus, however, which grows from a yellow ozonium. *C. radians* resembles *C. laniger* from which it may be separated by the much smaller scales upon the pileus.

VELIFORMES. Pileus very thin, plicate-sulcate, splitting along the lines of the gills. Plants usually small.

Section VII. Cyclodei. Stem with a movable ring. Plants small.

205. Coprinus bulbilosus Pat.

Patouillard, Tab. Anal. Fung., 60.

Illustrations: Ibid, Fig. 658.
Plate XL of this Report.

PILEUS 8-10 mm. across, convex, margin striate, at first incurved then expanding, gray, disk tinged yellow, covered with white meal. GILLS narrow, gray. STEM 2-3 cm. long, slender, white, base bulbous, ring loose, at some distance from base, white. SPORES 8-9 x 7-8 x 4 micr., compressed, oval to subglobose.

On horse dung. Readily grown in cultures from spores. Saccardo, Sylloge, says "spores angular." In our specimens the spores are slightly angular as seen in one plane.

Section VIII. Lanulati. Pileus covered with a downy or cottony layer which often has the appearance of a dense coat of soft mealy vesicles.

206. Coprinus stercorarius Fr.

Fries, Epicr., p. 251.

Illustration: Cooke, Ill., Pl. 685 A.

PILEUS 1-25 cm. high, ovate then companulate, sometimes expanded and rolling up at the margin, very thin, margin striate, densely covered with a white glistening meal. GILLS adnexed,

2-3 mm. broad, sub-ventricose. STEM 7-12 cm. long, at first ovately bulbous then elongated and equally attenuated upwards from the base, hollow, white, at first mealy. SPORES black, 6-8 x 3-4.5 micr.

The specimens referred to this species are smaller than the dimensions given in the description. Otherwise they agree with the description in the sense of Saccardo. Massee, British Fungus Flora, Vol. 1, p. 326, gives the spore measurements as 14-15 x 8-9.

Found but once upon cow dung in woods near Ann Arbor.

207. Coprinus sclerotigenus E. & E.

Ellis & Everhart, Microscope, 1890.

Illustrations: Microscope, 1890, Fig.
Massee, Ann. Bot., Vol. 10, Pl. XI, Figs. 26-28.
Plate XLI of this Report.

PILEUS .5-1.2 cm. high and broad, ovoid or ovoid-oblong, then campanulate (at first covered with a white mealy veil which later becomes dark and sometimes almost entirely disappears). STEM 2.5-10 cm. high, slender, subequal, usually straight above and more or less flexuous below where it is downy. GILLS adnexed. SPORES obliquely elliptical, 8-10 x 5-6 micr.

Springing from an irregularly subglobose, rugulose, sclerotium which is black outside, white inside. On sheep's dung.

Although nothing is said in the original description about a veil, the type specimens at the New York Botanical Garden still show some of the mealy white covering of the pileus. This plant was first found at Ann Arbor and later in other localities. It was always found growing from sclerotia in dung which had apparently been upon the ground for some time, often over winter. These sclerotia were repeatedly grown from spores in the laboratory and, after a certain amount of drying out, sporophores grew from the sclerotia. By alternately moistening and drying the sclerotia several crops of sporohores were produced. This plant may be identical with *C. tuberosus* Quel.

208. Coprinus narcoticus Fr.

Fries, Epicr., p. 250.

Illustrations: Cooke, Ill., Pl. 680 b.
Plate XLI of this Report.

PILEUS 1-2 cm. across, *foetid,* very thin, cylindric-clavate then expanded, at length revolute, covered at first with recurved, white floccose scales, then naked, grayish white, hyaline, striate. GILLS free but nearly reaching the stem, white then black. STEM 3-5 cm. long, 2 mm. thick, fragile, at first covered with white down, then almost glabrous, hollow. SPORES 11 x 5-6 micr., elliptical.

On dung, caespitose. ODOR strong and disagreeable. Not common.

209. Coprinus brassicæ Pk.

Peck, N. Y. State Museum Rep. 43, 1878.

Illustrations: Peck, N. Y. State Mus. Rep. 43, Pl. 2, Fig. 9-14.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 4.

PILEUS 8-10 mm. broad, at first ovate or conical, then broadly convex, squamulose, finely striate to the disk, white becoming grayish-brown, membranaceous, margin generally splitting and becoming recurved. GILLS narrow, crowded, reaching the stipe, brown with a ferruginous tint. STEM 16-20 mm. long, slender, glabrous, hollow, slightly thickened at the base, white. SPORES 7.5 x 5 micr., elliptical, brown. On decaying stems of cabbage and other vegetable debris.

Occasional upon vegetable debris of various kinds. Palmyra, Ann Arbor. We have found this fungus upon corn stalks, weed stalks and dead grass.

It seems very probable that this is the plant figured and described as *C. tigrinellus*, Boudier, Table 139, and *C. fricsii* Quel. (Patouillard, Pl. 446.)

Section IX. Furfurelli. Pileus with micaceous particles or mealy granules.

210. Coprinus patouillardi Quel.

Quelet, Assoc. Fr., 1884, p. 4.

Illustration: Plate XLII of this Report.

PILEUS 1-3 cm. broad, ovate, oblong, then conico-campanulate and finally revolute, at first finely striate then deeply plicate, very thin, white or ashy with pulverulent particles, yellowish to brown at the center. GILLS narrow, free but close to stem, white then smoky brown. STEM 2.5-5 cm. long, 1-2 mm. thick, fragile, smooth or slightly tomentose or pulverulent at base, white. SPORES 8-7 x 4.5 micr., ovate-triangular to pentagonal.

Common on dung, usually appearing with *C. radiatus* or a little later. There seems to be considerable variation in this plant both in regard to size and color. In young stages, especially in dry weather, the pileus is densely covered with dead white to gray particles, which gradually become brown as the pileus develops. The shape of the spore is characteristic and the variation in size less than in many other Coprini. In young stages it is readily distinguished from *C. radiatus* by its longer, more cylindrical shape and by its thicker white veil.

211. Coprinus radiatus Fr.

Fries, Epicr., p. 251.

Illustration: Cooke, Ill., Pl. 682 a.

PILEUS 2-15 mm. wide, at first ovate or short cylindrical, then campanulate, finally nearly or quite plane and slightly depressed at the center, very thin, deeply plicate; pileus with a few brown granular flecks or scales, slightly pruinose with a few gland-tipped hairs, pale brown or yellowish brown, darker at disk, becoming gray. GILLS narrow, distant, free. STEM 2-6 cm. high, 1.5 mm. thick, slender, fragile, hollow, white, becoming darker with age, slightly pruinose with glandular hairs. SPORES 10-13 x 8-10 micr., regularly elliptical, very dark.

Very common upon dung. This is probably our most common dung-inhabiting Coprinus. It may be found at almost any time during the summer season upon dung in pastures. If fresh horse

dung be placed in a damp chamber, troops of this fungus will appear within 10-14 days. Larger specimens appear at first; successive plants appear smaller and smaller until they are often only one or two millimeters in diameter and one or two centimeters high. Just as there is much variation in the size of the fungus there is wide variation in the size of the spores. Occasionally the specimens are found with small spores 7-10 x 5-8 micr., as given by Saccardo (Sylloge, Vol. 5, p. 1101). Usually, however, they average as large as given in our description. Specimens of this plant have been distributed in exsiccati under the name of *C. ephemerus* and *C. plicatilis*. The plant figured by Buller as *C. plicatiloides* (Researches in Fungi) is evidently *C. radiatus*.

Section X. Hemerobii. Pileus always glabrous or slightly pruinose with minute hairs. No universal veil. A few scurfy particles may be found by the breaking of the cuticle or trama when the pileus becomes plicate.

212. Coprinus ephemerus Fr.

Fries, Epicr., p. 252.

Illustrations: Cooke, Ill., Pl. 685 f.
Plates XLII and XLIII of this Report.

PILEUS 1-2 cm. across, ovate, then campanulate, finally expanded, often splitting and revolute, margin sometimes uneven, striate, plicate when expanded, very thin, disk even or slightly elevated. Yellowish brown to reddish bay at the disk, at first slightly pruinose with minute hairs. GILLS linear, slightly adnexed or barely reaching the stem, usually white at margin. STEM 3-6 cm. high, 1-2 mm. thick, equal or slightly tapering upward, hollow, white. SPORES 15-17 x 7-8 micr., black in mass.

Common upon dung or freshly manured ground.

In an examination of different exsiccati, we have found abundant evidence of the truth of Saccardo's statement that many different species have been confused under the name of *C. ephemerus*.

We have found well-marked specimens of *C. radiatus, C. plicatilis*, and *C. spraguei* all under the name of *C. ephemerus*. Even as we have limited this species, there are many distinct forms which may be readily distinguished. We have grown several of these varieties from spores and have found them to be constant and, even in young stages, the differences are often apparent to the naked eye. One

common form has shorter spores (11-13 micr.), which are distinctly angular when viewed in one plane. The deep bay disk and peculiar pruinose character of the plants make it possible to identify this form almost as soon as the buttons appear, see plates XLII, XLIII. A less common form resembles in the young stages very small specimens of *C. micaceus*. The spores are elliptical, 11-13 micr. long. We have grown another larger and lighter colored form with two-spored basidia.

213. Coprinus silvaticus Pk.

Peck, N. Y. State Mus. Rep. 24, p. 71, 1872.

Illustrations: Ibid, Pl. 4, Fig. 10-14.

PILEUS 12-30 mm. broad, convex, membranaceous, plicate-striate on margin, dark brown, disk very thin, fleshy. GILLS sub-distant, narrow, adnexed, brownish then black. STEM 5 cm. high, 1 mm. thick, slender, fragile, smooth, hollow, white. SPORES 12.5 micr. long, gibbous-ovate. On ground in woods.

This plant was found once at Ann Arbor and once at Bay View. The gibbous spores are very characteristic.

214. Coprinus boudieri Quel.

Quelet, Bull. Soc. Bot. Fr., 1877.
Peck, N. Y. State Mus. Rep. 26, p. 60, as *C. angulatus.*

Illustrations: Ibid, Tab. 5, Fig. 4.
Lloyd, Mycological Notes, Vol. I, Figs. 21-22, p. 47. (As *C. angulatus.*)

PILEUS 1-2.5 cm. broad, membranaceous, hemispherical, or convex, plicate-sulcate, reddish brown, smooth or minutely pruinose, disk smooth. GILLS subdistant, reaching the stem, whitish then black, the margins often remaining white. STEM 2.5-5 cm. long, 1-1.5 mm. thick, equal, smooth or sub-pruinose, white. SPORES 7-12 x 6-10 micr., compressed, *angular, key-stone shaped.*

Upon soil in woods. Rare.

The peculiar angular sub-ovate or key-stone shaped spores are very characteristic of this plant.

215. Coprinus plicatilis Fr.

Fries, Epicr., p. 252.

Illustrations: Cooke, Ill., Pl. 686 a.
Massee, Ann. Bot., Vol. 10, Pl. XI, Figs. 23-25, 1896.
Gillet, Champignons de France, No. 185.

PILEUS 1-2.5 cm. across, ovate-cylindrical, then campanulate, membranaceous, sulcate to disk, brown, then grayish; disk remaining darker, rather broad, becoming depressed. GILLS distant, narrow, *attached to a collar at some distance from the stem.* STEM 5-7 cm. long, 2 mm. thick, equal, white, smooth, hollow. SPORES 10-12 x 7.5 to 8.5 x 5-6 micr., compressed, broadly ovate.

Rather common among grass at roadsides, etc.

As in the case of *C. ephemerus* there has been considerable confusion of species under the name of *C. plicatilis.* We do not, however, find as much variation in this plant as in *C. ephemerus.*

Psathyrella Fr.

(From the Greek, diminutive of *Psathyra.*)

Black-spored. Gills at length uniformly dark-colored, *not deliquescing,* nor variegate-dotted. Pileus membranous, *striate or sulcate,* margin at first straight, not exceeding the gills. Stem slender, confluent. Veil inconspicuous.

Small, thin-capped mushrooms, growing on debris in woods, on the ground in low grassy places, in gardens, etc. With the exception of *P. disseminata,* the species are not well known. Peck has named twelve species found in the United States and a number of Friesian species are known to occur. The plants often have the appearance of the small, evanescent species of Coprinus, but the gills do not deliquesce. They differ from Panoeolus in the striate pileus, the non-variegated gills and the margin of pileus not exceeding the gills. I have definitely studied only two species.

216. Psathyrella disseminata Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 657.
Gillet, Champignons de France, No. 586.
Patouillard, Tab. Analyt., No. 351.
Atkinson, Mushrooms, Fig. 49, p. 48, 1900.
Ricken, Blätterpilze, Pl. 23, Fig. 4.
Hard, Mushrooms, Fig. 280, p. 347, 1908.

PILEUS 5-10 mm. broad, oval then campanulate, at first white, then gray or grayish-brown, *prominently sulcate-plicate* to the small buff umbo, at first covered by microscopic, erect, one-celled hairs, scurfy, glabrescent. FLESH membranous, very thin. GILLS adnate, ascending, rather broad, ventricose, sub-distant, at first white, then ashy and finally uniformly black. STEM slender, 2-3 cm. long, .5 to 1 mm. thick, hollow, *white,* at first minutely hairy with spreading hairs, glabrescent. SPORES 7-10 x 4-5 micr., elongate-elliptical, smooth, purple-black under microscope. BASIDIA subcylindrical, 20-27 x 6-7 micr., 4-spored, interspersed with abundant sterile, inflated cells. CYSTIDIA none. ODOR none. TASTE mild.

On debris and on the ground in woods in extensive gregarious and caespitose clusters of numerous individuals.

Throughout the State. May-October. Common.

This species is well named; the thousands of plants which often cover the ground and debris around stumps are an attractive sight when fresh. It sometimes appears in greenhouses according to Atkinson. The microscopic structure of the hymenium is similar to that of the Coprini, and some authors (vide Ricken) refer it to that genus.

217. Psathyrella crenata (Lasch.) Fr.

Hymen. Europ., 1874.

Illustration: Cooke, Ill., Pl. 847.

"PILEUS 2-3.5 cm. broad, hemispherical, hygrophanous, rufescent or ochraceous, then pallid, atomate, *sulcate-plicate,* margin at length *crenate.* FLESH membranous. GILLS adnate, subventricose, yellowish-fuscous than black. STEM 6-7 cm. long, 1-2 mm. thick, slender, glabrous, whitish, striate and mealy at apex."

The description is adopted from Fries. Our plants had a more convex pileus, at first dark gray then rufescent or ochraceous; the gills were rather narrow, sub-distant, edge white-fimbriate; stem fragile, stuffed-hollow; the spores elliptic-oblong, 10-12.5 x 6-7 micr., smooth, purplish-black under microscope. CYSTIDIA few or none. The crenate folds of the margin of the cap included two to three striae. It agrees well with Cooke's figure.

Panœolus Fr.

(From the Greek, *panaiolus,* meaning all-variegated.)

Black-spored. Gills grayish-black, dotted by the spores, ascending, more or less attached but seceding. Stem central, polished, subrigid. Pileus *not striate,* rather firm but not very fleshy. Veil woven-submembranous or subsilky.

Dung-inhabiting, slender-stemmed, slightly persistent but putrescent mushrooms, whose otherwise glabrous pileus is either appendiculate or slightly white-silky on the margin by the collapsing of the more or less evanescent veil. Often ring-marked on the stem by the spores falling on the remnants of the veil. It is a rather small genus, and the rarer species are not well known. Peck has described five species, of which *P. epimyces* is to be looked for under Stropharia. The spores are opaque, black, smooth and usually lemon-shaped or elliptical; they remain aggregated in tiny clusters on the gills as these mature and so produce the dotted-variegated appearance of the gills. Later the gills become entirely gray-black to black.

218. Panœolus solidipes Pk. (Edible)

N. Y. State Mus. Rep. 23, 1872.

Illustrations: Ibid, Pl. 4, Fig. 1-5.
Hard, Mushrooms, Pl. 41, Fig. 278, p. 343.
White, Conn. State Geol. & Nat. Hist. Surv. Bull., No. 3, Pl. 27, p. 53.
Plate XLIV of this Report.

PILEUS 4-10 cm. broad, *large,* firm, at first hemispherical then broadly convex, obtuse, moist, glabrous, *white* when fresh, even, *at length rimose-scaly and yellowish,* especially on disk. FLESH rather thick, white, watery near the gills. GILLS ascending, nar-

rowly adnate, *broad, ventricose,* close, white at first, then ashy to black, variegated by the spores, edge white-flocculose. STEM long and rather stout, 8-20 cm. long, 5-15 mm. thick, equal, firm, *solid,* fibrous, glabrous, *white* within and without, *apex striate* and beaded with drops, straight or curved at base, sometimes twisted. SPORES broadly elliptical, abruptly narrowed at base, smooth, 15-18 x 9-11 micr., black. STERILE CELLS on edge of gills, broadly lanceolate, 30-35 micr. long, subobtuse. BASIDIA short-clavate, about 33 x 14 micr., 4-spored. ODOR and TASTE slight. *Edible.*

Gregarious or subcaespitose. On manure piles rich in straw, on dung and on richly manured lawns. Ann Arbor. May-July. Spasmodic.

This is our largest Panœolus and an excellent species for the table. It is probably to be found throughout the southern part of the State; it has only appeared during a few seasons but then in abundance. The large size, white color when fresh, the solid stem and the marked striations on the upper portion of the stem are its distinguishing characters. The striations sometimes extend the whole length of the stem. Its flavor when cooked is quite agreeable. It is often a noble plant and our illustration does not do it justice.

219. Panœolus retirugis Fr. (Suspected)

Epicrisis, 1838.

Illustrations: Gillet, Champignons de France, No. 509.
Murrill, Mycologia, Vol. 3, Pl. 40, Fig. 7.
Atkinson, Mushrooms, Pl. 11, Fig. 45, p. 45, 1900.
Hard, Mushrooms, Pl. 40, Fig. 276, p. 340, 1908.
Reddick, Ind. Geol. & Nat. Hist. Resour. Rep. 32, Fig. 9, p. 1231, 1907.

PILEUS 1-3 cm. broad, rather firm, at first elliptic-oval, then campanulate-hemispherical, obtuse, glabrous, *dark smoky when young and wet,* becoming paler, or in dry weather grayish, pale clay color or creamy-white, *shining-micaceous when dry,* surface usually *reticulate-veined on disk,* sometimes even, margin connected with *stem in young stage by a floccose-submembranous, ring-like veil,* veil soon broken and margin markedly *appendiculate* in expanded pileus. FLESH rather thin, equal. GILLS adnate-seceding, *broad,* ventricose, close, white then variegate-spotted by the

black spores, edge white-flocculose. STEM 5-16 cm. long, 2-6 mm. thick, equal, cylindrical, sometimes flexuous, whitish, *rufescent* or tinged purplish within and without, darker below, hollow, *often covered with frost-like bloom,* sometimes minutely rimulose, bulbillate. SPORES broadly oval-elliptical, ventricose, 15-18 x 9-11 micr., smooth, black. *Sterile cells* on edge of gills, narrow, subcapitate.

Gregarious or scattered on dung-hills, manured lawns, fields, road-sides, etc., in woods or in the open. Throughout the State. May-October. Very common.

The most widely distributed of our species. In favorable weather it occurs abundantly where stock is pastured. In dry weather it is smaller and paler. In the woods or in drizzly weather the stems are large and the colors are very different. Some disagreement exists as to the size of the spores, which are variable in dimension but rather constant in shape. Ricken describes and figures a form which is scarcely our plant, and Cooke's figure is not convincing. It is not poisonous but is rather unattractive and usually avoided when collecting for the table. The older name is *P. carbonarius.* It is possible that this runs into *P. campanulatus* Fr. and is often confused with it.

220. Panœolus campanulatus Fr. (Suspected)

Epicrisis, 1836-38.

Illustration: Ricken, Blätterpilze, Pl. 69, Fig. 8.

"PILEUS 2-4 cm. broad, brownish-gray or yellowish-gray, *persistently conic-campanulate,* never expanded, *glabrous,* often somewhat silky-shining, *neither hygrophanous nor viscid,* margin somewhat appendiculate by the rather persistent veil. FLESH thin, concolor. GILLS adnate, ventricose-ascending, broad, close, variegated gray to black by the spores, edge white-flocculose. STEM 7-10 cm. long, 1-2 mm. thick, *straight,* rigid-fragile, equal, *reddish-brown,* pulverulent-pruinose, apex striate, black-dotted and beaded with drops in wet weather. SPORES lemon-shaped, 15-18 x 10-13 micr., smooth, opaque, black."

The description is adopted from Ricken. According to Godfrin (Bull. Soc. Myc. de France, 19, p. 45) this species differs from *P. retirugis* in the structure of the cuticle. In the latter species the surface cells of the pileus are four or five layers thick, gradually passing into the longer, tramal cells below; while in *P. campanu-*

latus there are only one or two rows of abruptly differentiated cells with large, clavate, erect cystidia-like cells intermingled. The species has not been uniformly conceived by different authors and needs further comparison. It is said to be very common in Europe and is widely reported in this country. The majority of authors give the same spore-size as Ricken.

221. Panœolus papillionaceus Fr. (Suspected)

Epicrisis, 1836-38.

Illustration: Ricken, Blätterpilze, Pl. 69, Fig. 3.

"PILEUS 2-4 cm. broad, subhemispherical, *at length* expanded, never viscid nor hygrophanous, *at length rimose-scaly or areolate, pallid or sordid-whitish* to smoky-gray or brownish-pallid, margin with evanescent, pallid veil. FLESH slightly thick, white. GILLS broadly adnate, often very broad, ventricose, close, variegated gray-blackish from the spores, at length black. STEM 6-8 cm. long, 2-5 mm. thick, cartilaginous-toughish, rigid, hollow, somewhat attenuated, *whitish,* with brownish base, apex striate and white-pruinose. SPORES lemon-shaped, 15-18 x 9-11 micr., smooth, black."

The description is adopted from Ricken. The spores are somewhat more narrow according to most authors. This species seems to be infrequent with us. Small forms occur which may be referred here, in which the pileus is less than a centimeter broad and the spores are smaller. The species is not too well known. Its main character seems to be the whitish stem but no doubt the forms with such a stem need segregation as shown by some of my collections.

222. Panœolus sp.

PILEUS 1-2.5 cm. broad, campanulate, obtuse, not expanded, 1-1.5 cm. high, hygrophanous, bibulous, *smoky gray when moist,* livid-buff when dry, glabrous, dull and subpruinose, at length coarsely crenate-wavy when dry; veil absent or fugacious. FLESH thickish, rather firm, concolor (moist), then pallid. GILLS rounded behind, adnate-seceding, not broadly attached, ventricose, crowded, gray then variegated black, edge white-flocculose. STEM 5-7 cm. long, slender, 1-2 mm. thick, equal, rigid-fragile, flexuous or straight, hollow, *livid smoky-gray,* concolor within, *pruinose,* glabrescent, base white-mycelioid. SPORES elliptical, ventricose, 9-10

x 6 micr., smooth, obtusely pointed, black. *Sterile cells* on edge of gills, linear, subcapitate, 30-40 x 4-5 micr. ODOR none.

Gregarious. On horse dung and soil, in woods pastured by horses. Ann Arbor. October.

This is close to *P. sphinctrinus* Fr. in most of its characters, but differs in its much smaller spores and in the lack of a persistent, appendiculate veil. The surface portion of the pileus has the same structure that is given by Godfrin (l. c.) for *P. sphinctrinus.*

AMAUROSPORAE

Psalliota Fr.

(From the Greek, *Psallion,* a ring or collar.)

Purple-brown-spored. Stem *fleshy,* separable from the pileus, provided with a persistent or evanescent *annulus.* Gills *free,* usually pink or pinkish in the young stage.

Fleshy, mostly compact and large mushrooms, growing on the ground in woods among fallen leaves, etc., or on lawns, pastures, open ground or cultivated fields. They correspond to Lepiota of the white-spored group. They are all *edible,* the larger ones being among the best known and most widely used of edible mushrooms. Several species have been cultivated a long time and are of considerable commercial importance, especially in Europe. (See remarks under *P. campestris.*)

The PILEUS is glabrous, fibrillose or fibrillose-scaly, either white or whitish or dark colored by the color of the fibrils on its surface; these fibrils compose a thin layer on the very young cap, and as the cap expands are broken up, except at the slow-growing center, into fibrillose scales. The young cap of these species is therefore much more uniformly colored than later in the expanded stage. The surface of the whitish species is often stained somewhat with yellowish of rufescent hues when bruised or in age. The *size* varies; most species may become quite large, *P. subrufescens* reaching a size of 20 cm. across the cap; a few are quite small. The surface is dry, or it may be slightly viscid as in *P. cretacella.* The GILLS are free, as in Lepiota. When the button is quite small it is white, but in some species, e. g. *P. campestris,* becomes pink quickly. This character has been used to separate the species, but is a difficult point for beginners to determine. As the spores begin to take on color, the pur-

plish-brown hues appear and when old, most gills appear blackish-brown because of the dense layer of spores. The STEM is either almost undifferentiated within and is then solid, or has a distinct pith which soon disappears and leaves it hollow, often in the form of a narrow tubule. It is fleshy and when fresh has no cartilaginous cortex; it is, however, of different texture from that of the pileus and easily separates from it.

The VEIL is single or double. When double the substance of the under layer is similar to that of the pileus and the base of the stem and is probably a part of a universal cuticle. Sometimes it is very voluminous and forms a large pendulous annulus, as in *P. placomyces* and *P. subrufescens*. Usually it is quite thick and persistent. The lower layer breaks off soonest, ceases expansion and cracks into radial patches which remain on the under side of the annulus; sometimes, as in *P. abruptibulba,* it is very evanescent.

The genus may be divided into two sections based on the structure of the veil. The Friesian grouping is entirely artificial, and the difference in the color of the young gills, used by some as a basis for grouping, seems too variable a criterion for the purpose.

Key to the Species

(A) Plants large; pileus normally much more than 4 cm. broad. (See *P. campestris.*)
(a) Growing in forests, thickets, groves, etc.
(b) Pileus white, not fibrillose-scaly, usually glabrous.
(c) Pileus turning yellowish on disk when rubbed; stem with small, abrupt bulb. 226. *P. abruptibulba* Pk.
(cc) Pileus firm, chalky-white, not stained yellow; without abrupt bulb. 223. *P. cretacella* Atk.
(bb) Pileus with fibrils or fibrillose scales on the surface.
(c) Flesh turning pink to blood-red where broken; fibrils brownish-gray. 231. *P. haemorrhodaria* Fr.
(cc) Flesh not or scarcely changing color.
(d) Annulus single, not covered on under side with floccose patches; fibrils brown. 230. *P. silvatica* Fr.
(dd) Annulus double, as shown by the patches on under surface.
(e) Disk of pileus blackish, fibrils brown; odor not marked. 227. *P. placomyces* Pk.
(ee) Disk reddish-brown, fibrils tawny; odor of almonds; large. 228. *P. subrufescens* Pk.
(aa) Growing in fields, open places, cultivated grounds or lawns, not scaly.
(b) Annulus as a broad band with spreading edges; gills very narrow as compared to the thick flesh; in cities. 224. *P. rodmani* Pk.
(bb) Annulus different.
(c) Pileus large, surface stained yellowish on disk when bruised; annulus double. 225. *P. arvensis* Fr.
(cc) Pileus medium, surface unchanged; annulus lacerated, simple; gills bright pink. 229. *P. campestris* Fr.

(AA) Pileus 1-5 cm. broad.
(a) Flesh of stem soon blood-red; in hot-houses. 235. *P. echinata* Fr.
(aa) Flesh whitish, not turning red.
(b) Fibrils of pileus grayish-brown or brown; gills at first gray. 232. *P. micromegetha* Pk.
(bb) Not markedly fibrillose.
(c) Pileus creamy-white, with yellowish stains. 233. *P. comtula* Fr.
(cc) Pileus with pinkish to reddish-brown hues, slightly fibrillose. 234. *P. diminutiva* Pk.

Section I. Bivelares. Annulus double, with thick flocculose patches on under side.

223. Psalliota cretacella Atk. (Edible)

Jour. of Mycology, Vol. 8, 1902.

PILEUS 4-7 cm. broad, convex to expanded, thin, *glabrous,* white, sometimes inclined to be slightly viscid in wet weather, even. FLESH white, sometimes with a tinge of pink. GILLS free, crowded, narrow, 3-4 mm. broad, narrowed behind, white at first, *then slowly pink, later dark grayish-brown,* not becoming blackish. STEM 5-8 cm. long, 6-10 mm. thick, tapering from the enlarged base, white, glabrous above the annulus, chalky-white below and covered with minute, white, powdery scales often arranged in irregular concentric rings below, solid, but center less dense. ANNULUS *double,* persistent, white, smooth above, the lower surface with very fine floccose scales similar to those on the stem from which the annulus was separated. SPORES 4-5 x 3 micr. ODOR and TASTE of almonds as in *P. arvensis.*

Gregarious or subcaespitose. On the leaf-mold, debris, etc., in coniferous regions. Marquette, Bay View. August-September. Infrequent.

The description is adapted from that of Atkinson. *P. cretacella* is closely related to *P. cretaceus* Fr. which differs, according to Fries' description, in the hollow stem, the blackish-fuscous gills when mature and in that the pileus becomes at length scaly. Our plants have a glabrous chalky-white pileus and solid stem. Ricken gives spores of *P. cretaceus* as 8-9 x 5-6 micr.

224. Psalliota rodmani Pk. (Edible)

N. Y. State Mus. Rep. 36, 1884.

Illustrations: Peck, N. Y. Mus. Rep. 48, Pl. 9, Fig. 1-6, 1896.
Marshall, The Mushroom Book, Pl. 25, op. p. 76, 1905.
Atkinson, Mushrooms, Fig. 17, p. 19, 1900.
Hard, Mushrooms, Fig. 250, p. 309, 1908.
Plate XLV of this Report.

PILEUS 4-10 cm. broad, (more often medium size), at first depressed-hemispherical to broadly convex, at length subexpanded to plane, firm, dry, *glabrous,* subsilky, *white* or whitish, cream color to subochraceous in age, the margin at first incurved and surpassing the gills. FLESH *thick,* compact, white, not changed by bruising. GILLS free but nearly or quite reaching the stem, abruptly rounded behind, *narrow, width about one-third the thickness of pileus,* crowded, at first dull pink, then purplish-brown, finally blackish-brown, edge entire. STEM *short,* 2-5 cm. long, 1-2.5 cm. thick, *stout, equal, solid,* glabrous below, apex slightly scurfy, white within and without, *provided at the middle or below with a band-like, double,* white ANNULUS, with somewhat spreading edges, sometimes narrow and merely grooved, or somewhat lacerated. SPORES minute, 5-6.5 x 4-4.5 micr., broadly elliptical or broadly oval, smooth, purplish-brown, blackish-brown in mass. BASIDIA 30-36 x 8 micr., 4-spored. ODOR and TASTE agreeable.

Solitary on the ground especially along city pavements, or caespitose on lawns or grassy places. Throughout the State. Ann Arbor, Detroit, Holland, Houghton, etc. May-October. Not infrequent.

A well-marked species, whose margined, band-like annulus, narrow gills, solid stem and squatty habit characterize it sufficiently. The young gills are white for a much longer time than in *P. campestris.* The pileus may become yellowish-tinged but the flesh is not changed by bruising except that it becomes slightly rufescent in the stem. Peck says the annulus is rather thick at times; in our specimens it was thin and almost membranous. Sometimes it occurs on lawns in dense, caespitose clusters of 50 to 100 individuals; such a growth was observed in Ann Arbor by myself, and the same condition has been reported to me by Dr. L. L. Hubbard at Houghton. It apparently prefers city conditions, as it is almost exclusively found there. It is edible and much prized by those acquainted with it.

225. Psalliota arvensis Fr. (Edible)

Epicrisis, 1836.

Illustrations: Fries, Sverig. ätl. o gift. Swamp, Pl. 4.
Cooke, Ill., Pl. 523.
Gillet, Champignons de France, No. 571 (as Pratella).
Berkeley, Outlines, Pl. 10, Fig. 4.
Michael, Führer f. Pilzfreunde, Vol. I, No. 61.
Ricken, Blätterpilze, Pl. 62, Fig. 2.
Hard, Mushrooms, Pl. 34 and Fig. 252, p. 312.
Swanton, Fungi, etc., Pl. 38, Fig. 13, op. p. 114.
Peck, N. Y. State Mus. Rep. 48, Pl. 8.
Plate XLVI of this Report.

PILEUS 5-20 cm. broad, *large,* subhemispherical at first, then convex-expanded, disk plane, firm, even, *glabrous,* almost shining, or with appressed, small, fibrillose scales, dry, *white or tinged yellowish-ochraceous on disk, especially when rubbed,* sometimes rimose-areolate. FLESH *thick, white,* at length yellowish-tinged. GILLS free, crowded, rather broad, *at first whitish then slowly grayish-pink, finally blackish-brown,* edge entire. STEM 5-20 cm. long, 10-30 mm. thick, *stout,* white, *yellowish-stained where bruised,* silky-shining above the annulus, stuffed by a loose pith, *then hollow,* equal-cylindrical above the abrupt, small and short bulb, *glabrous*; ANNULUS thick, rather large, *double,* the lower layer radially cracked into rather large ochraceous-tinged patches. SPORES 6-7 x 4-4.5 micr., elliptical, smooth, purplish-brown, blackish-brown in mass. ODOR *of anise or of benzaldehyde.*

On the ground, cultivated fields, pastures, on grassy mounds in woods, in the north on lawns; scattered-gregarious or solitary. Throughout the State, more frequent in the Northern Peninsula. July-October. Infrequent in the south part of State.

The "field mushroom" or "ploughed land mushroom" is not limited to cultivated fields. It was found in several cities along Lake Superior on lawns. It is much prized by the inhabitants for the table. It is larger than *P. campestris,* and can be distinguished by the tendency of the center of the cap and base of stem to turn yellowish-ochraceous when rubbed or bruised. The gills, although pink for a brief time at one stage, are white much longer than in the other species. Also there is often a slight but distinct odor of oil of bitter almonds when the flesh is crushed. It is curious to note the various spore-measurements given by authors. Ours agree practically with

the size given by Bresadola, Ricken and Massee. On the other hand, Karsten, W. Smith, Schroeter, Saccardo and Peck give them 9 (or 11) x 6 micr. and as one suspects from other remarks about the plant, some other species is probably at times mistaken for it. Ricken, whose figure is numbered, through an error, for that of *P. cretaceus,* emphasizes the point that in his plants the flesh of the stem becomes blackish in age. This has not been observed in our region and the dried specimens do not show it. Its edibility is not to be questioned.

226. **Psalliota abruptibulba** Pk. (Edible)

N. Y. State Mus. Bull. 94, 1905 (as Agaricus).
N. Y. State Mus. Mem. 4, 1900 (as *Agaricus abruptus*).

Illustrations: Ibid, Pl. 59, Fig. 8-14, 1900.
Hard, Mushrooms, Fig. 254, p. 313, 1908.
Atkinson, Mushrooms, Fig. 19-20, 1900 (as *P. silvicola*).
Marshall, Mushrooms, Pl. 26, op. p. 77, 1905.
Plate XLVII of this Report.

PILEUS 7-15 cm. broad, convex then *expanded-plane,* brittle, dry, glabrous or covered with white, appressed silky fibrils, sometimes obscurely appressed-scaly, *white or creamy-white,* often with dingy yellowish stains on disk, silky-shining. FLESH moderately thick, *turning yellowish when bruised,* especially under the cuticle. GILLS free, *remote,* crowded, *narrow, soon pink,* then dark brown, edge entire. STEM 8-15 cm. long, 8-15 mm. thick, cylindrical or tapering upward from a small, *subabrupt bulb,* relatively slender at times, creamy-white, yellowish when bruised, stuffed then hollow, subglabrous. ANNULUS broad, *double,* smooth above, cracking below into thick, sometimes evanescent, yellowish patches. SPORES 5-6 x 3-4 micr., elliptical, smooth, purple-brown. ODOR and TASTE agreeable.

Scattered or subcaespitose on the ground among fallen leaves in frondose or mixed woods. Throughout the State. July-October. Fairly common.

The species is known by its habitat in woods, its flat cap at maturity which is shining-whitish, the rather slender, abruptly-bulbous stem and the tendency for the flesh of the cap and stem to become yellowish where bruised. It differs from *P. arvensis* in its very different stature; from *P. placomyces* in the absence of any brownish or rufous fibrils on the cap, and from *P. sylvaticus* Fr. by its

bulbous stem. Peck first referred it to *P. arvensis* as a variety, later he called it *Agaricus abruptus;* but as this name was preempted it was changed to *abruptibulba.* Sometimes the veil appears to be single, but this is merely accidental. McIlvaine says "it has a strong, spicy, mushroom odor and taste and makes a highly flavored dish. It is delicious with meats; the very best mushroom for catsup." Since it occurs in the woods, it must be carefully distinguished from the deadly, white Amanitas.

227. Psalliota placomyces Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: N. Y. State Mus. Rep. 48, Pl. 9, Fig. 7-12.
Atkinson, Mushrooms, Fig. 21-23, pp. 23-24, 1900.
Hard, Mushrooms, Fig. 255, 257, pp. 314-316, 1908.
Clements, Minn. Mushrooms, Fig. 42, p. 74, 1910.

PILEUS 5-12 cm. broad, at first broadly ovate, convex-expanded, finally *quite plane,* sometimes subumbonate, not striate, *squamulose,* whitish, except where *dotted with the brown scales which are more dense toward the center,* forming a blackish-brown disk, in age the surface may be entirely brown. FLESH white or tinged yellowish under cuticle, *rather thin* except disk. GILLS free, crowded, thin, white at first, *soon pink* then blackish-brown, edge entire. STEM rather long, 7-12 cm. long, tapering upward or *clavate-bulbous,* 4-8 mm. thick, stuffed then hollow, whitish, the bulb sometimes yellowish-stained, glabrous. ANNULUS large, *superior, double,* the under layer cracking radially and leaving patches, finally darkened by the spores. SPORES 5-6 x 3.5-4 micr. (rarely few longer), elliptical-oval, nucleate, smooth, purplish-brown, blackish-brown in mass. ODOR not marked.

Solitary or scattered, sometimes a few caespitose, on the ground in frondose, hemlock or mixed woods, rarely on lawns. Ann Arbor, Lansing, New Richmond, probably throughout the State. July-September. Infrequent, during some seasons rare.

A beautiful plant when one comes across it at its best, with its artistically decorated cap and symmetrical stature. It differs clearly from all others. It is edible although the flesh is thinner than in the preceding species. It is known by the minute brown scales on the flattened cap, the clavate-bulbous stem and the large, flabby annulus. During some seasons, it seems to be absent even under favorable weather conditions.

228. Psalliota subrufescens Pk. (Edible)

N. Y. State Mus. Rep. 46, 1893.

Illustrations: N. Y. State Mus. Rep. 48, Pl. 7, 1896.
Plates XLVIII, XLIX, L, of this Report.

PILEUS 8-18 cm. broad, *large,* at first hemispherical then convex, *finally plane,* becoming wavy and split on the margin, *silky-fibrillose at first,* the fibrillose surface soon breaking up to form *very numerous, appressed, pale tawny fibrillose scales,* disk reddish-brown and not scaly, sometimes rimose, not striate. FLESH white, unchangeable, *rather thin,* soft, fragile at maturity. GILLS free, not very remote, *narrow, crowded,* at first white, then pinkish, finally blackish-brown, edge at first minutely white-fimbriate. STEM 7-15 cm. long, *tapering upward,* 1-1.5 cm. thick at apex, twice as thick below, white and almost glabrous above the annulus, floccose-fibrillose to subscaly toward base, *stuffed by soft white pith then hollow,* the bulb varying clavate to more or less abrupt. ANNULUS very voluminous, reflexed, *double,* rather distant from the apex of the stem, smooth and white above, with soft, floccose, pale tawny scales below, becoming dark from spores. SPORES 6-7.5 x 4-5 micr., elliptical, smooth, dark purple brown, blackish-brown in mass. STERILE CELLS on edge of gills numerous, subcylindrical, very narrow, hyaline. ODOR when crushed, strong of almonds. TASTE of green nuts.

Caespitose, on masses of decaying fallen leaves in frondose woods and in richly manured hot-house beds. (It is also cultivated for the market.)

Ann Arbor, Detroit. August-October. Rather rare.

Our largest Psalliota, probably at times surpassing the size given above. The original description was made by Peck from old material, and later (48th Rep.) he points out that the cap is coated with fibrils which at length give it the scaly character. Peck's description of this species is, therefore, misleading, and probably his specimens did not show the full development of the scales shown in our photographs. Some of our specimens were sent to Dr. Peck who pronounced them *P. subrufescens* Pk. None of our other Psalliotas could be easily confused with *P. subrufescens* when it appears in the woods. Of the European species, *P. augusta* Fr. and *P. perrara* Bres. approach it in size. These are at once distinct, according to Ricken's descriptions, by their paler caps and larger spores. The

spores of *P. augusta* are 12-14 x 6-7 micr., per Ricken; of *P. perrara,* 8-10 x 5 micr., per Bresadola. *P. silvatica* Fr. differs in the smaller size, the simple annulus and differently colored pileus. *P. subrufescens* sometimes appears in hot-house beds and has been reduced to cultivation, where its characters seem to be somewhat changed, so that Peck has made a lengthy comparison between it and *P. campestris,* to which the wild form has no close resemblance.

Section II. Univelares. Annulus simple, not with thick floccose-patches on under side.

229. Psalliota campestris Fr. (Edible)

Syst. Myc., 1821.

Illustrations: (Selected, very numerous.)
Fries, Sverig. ätl. o. gift. Swamp., Pl. 5.
Cooke, Ill., Pl. 526.
Gillet, Champignons de France, No. 573 (As Pratella).
Michael, Führer f. Pilzfreunde, Vol. I, No. 60.
Bresadola, I. Fung. mang. e. velenos, Pl. 53.
Marshall, The Mushroom Book, Pl. 23, op. 74 and Pl. 24, op. 75, 1905.
Gibson, Our Edible Toadstools and Mushrooms, Pl. 5, p. 83 and Pl. 6, p. 89.
Murrill, Mycologia, Vol. I, Pl. 3, Fig. 1.
Hard, Mushrooms, Fig. 248 and 249, p. 307, 1908.
Atkinson, Mushrooms, Figs. 1-8, pp. 2-8, 1900.
Atkinson, Bot. Gaz., Vol. 43, p. 264 et. al., Pl. 7, 8, 9, 10, 11 and 12 (showing all stages of development).

PILEUS 4-7 cm. broad (occasionally larger, especially when cultivated), at first flattened hemispherical then convex-expanded or nearly plane, firm, even, *glabrous* or at length minutely floccose-silky or delicately fibrillose-scaly, dry, *white* (scaly forms are brownish, etc.), the margin extending beyond gills, edge often fringed when fresh by the tearing of the partial veil. FLESH thick, white, not changing when bruised. GILLS free but not remote, rounded behind, ventricose, not broad, close, almost from the very *first delicate pink, then deep flesh color,* finally purplish-brown *to blackish,* edge even. STEM 5-7 cm. long, thick, usually *subequal or tapering downward,* rarely subbulbous, solid-stuffed,

usually rather short and firm, *white* or whitish, glabrous. ANNULUS above and near the middle, edge lacerate, often evanescent in age, derived from the thin, simple, white, partial veil. SPORES elliptical, 7-9 x 4.5-5.5 micr., purple-brown, *blackish-brown in mass,* smooth. ODOR and TASTE agreeable.

On the ground in lawns, gardens, golf-links, roadsides, especially in sheep-pastures, sometimes in cultivated fields.

Throughout the State. Less frequent in spring, usually in July-October. Uncommon except locally during some seasons, rare at other times.

This is the well-known "pink-gilled" or "edible" mushroom, by many people in this country considered in addition to the "sponge mushroom," *Morchella esculenta,* as the only mushroom safe to eat; all others are dubbed "toadstools." Some persons, however, know and eat a larger number of kinds; again, all others are "toadstools" to them. The word toadstool, therefore, means nothing definite; it only expresses the ignorance of people concerning those fungi of which they are afraid. The two words refer to the same group of plants and can be used interchangeably.

In the young or "button" stage the gills are soon tinged pink, and as it is possible to mistake the button of the deadly, white *Amanita verna* for it at this stage, every button should be broken open while collecting. By the time the veil breaks the pink color of the gills is quite marked. All who use this mushroom, should read carefully the remarks under Amanita.

This mushroom has been eaten from time immemorial, and its artificial cultivation carried on extensively for centuries. In and around large cities, large establishments exist to raise it for the market, selling it for 75c to 90c a pound in this country. "The annual product of the Chicago mushroom beds is said to be from sixty to seventy-five tons." (Nat. Hist. Surv. of Chicago Acad. Sci. Bull. VII, part 1, p. 90.) Special underground mushroom houses, caves, abandoned mines, cellars, etc., have been adopted for the cultivation of this mushroom. Duggar states that in 1901 the total product of the mushroom industry in the environs of Paris, France, was 5,000 tons or 10,000,000 pounds. This shows the extent to which Europeans eat mushrooms as compared with our American consumption. About the same ratio exists in the use of the many different edible wild species. In this country we have hardly begun to realize the immense amount of palatable food that goes to waste in our fields and woods.

Numerous varieties of *P. campestris* have been described. With

us the white variety is the common form, although an occasional patch of the variety with brownish and more fibrillose caps may be found. The caps are apparently not as large as in more moist climates, although occasionally one finds large plants in cultivated fields. Var. *villaticus* Fr. has been raised to specific rank by Bresadola; the pileus of this species is large and scaly and the stem is scaly and coated or subvolvate by the inferior veil. I have not seen it. No discussion is given here of the cultivated varieties. Those interested in their cultivation should read Duggar's "The Principles of Mushroom Growing, etc." Bull. No. 85, Bureau of Plant Ind., U. S. Dept. Agr., or the chapter in Atkinson's Mushrooms, last edition.

230. Psalliota silvatica Fr. (Edible)

Epicrisis, 1836.

Illustrations: Bresadola, Fung. Trid., Vol. I, Pl. 90.
Cooke, Ill., Pl. 530 (=*P. perrara* per Bres.)
Michael, Führer f. Pilzfreunde, Vol. II, No. 68.

"PILEUS 8-11 cm. broad, campanulate then expanded, *at first cinereous* then yellowish-whitish with a rufous-fuscous center, *covered by brown scales.* FLESH rather thick except margin. GILLS free, remote, crowded, white at first, then rosy-flesh color, *at length reddish-cinnamon.* STEM 6-9 cm. long, 1-1.5 cm. thick, *hollow,* whitish, glabrous, or subfibrillose, equal or with a bulbous base, bulb sometimes marginate, white within when broken, yellowish at apex, slightly rose-red on sides. ANNULUS *simple,* ample, distant, superior, white, substriate, flocculose. SPORES 6-7 x 3.5-4 micr., elliptical, incarnate-fulvous. BASIDIA clavate, 25 x 6-7 micr. ODOR and TASTE agreeable."

Reported by Longyear. In woods.

The description is adopted from Bresadola. The descriptions in our mushroom books are scarcely satisfactory. The figures of Cooke and Gillet are said to depart from the characteristics of the plant. It seems to be rare, and I have never collected it. The gray color of the young plant and the truly brown color of the scales, the hollow stem and spores ought to make it recognizable. Ricken emphasizes the change of gills and flesh to blood-red when bruised and considers *P. haemorrhoidaria* as an autumnal form. This complicates matters, especially in the absence of specimens of our own.

231 Psalliota hæmorrhodaria Fr. (Edible)

Hymen. Europ., 1885.

Illustrations: Cooke, Ill., Pl. 531.
Gillet, Champignons de France, No. 577 (as Pratella).
N. Y. State Mus. Rep. 54, Pl. 75, 1901.

PILEUS 5-10 cm. broad, at first subglobose to subovate then campanulate-expanded, nearly plane, covered by rather dense, fibrillose, brownish-gray, appressed scales, sometimes glabrous toward margin and paler, margin subpersistently incurved. FLESH white, *turning pink to blood-red when broken,* thick on disk, thin on margin. GILLS free, moderately broad, crowded, white at first, then rosy-flesh-color, finally dark brown. STEM 5-10 cm. long, 8-15 mm. thick, subequal, rarely bulbous, *stuffed then hollow,* floccose-fibrillose, glabrescent, white or pallid, darker in age. ANNULUS large, pendulous, persistent, superior, simple, white, at length colored by spores. SPORES 6-7 x 4 micr., elliptical, purplish-brown, smooth. STERILE CELLS on edge of gills, clavate, enlarged-rounded above. ODOR and TASTE agreeable.

Caespitose or scattered, on the ground or about the base of trees in low places in mixed woods, usually near birch and maple trees. Marquette, New Richmond. August-October. Infrequent in the coniferous regions of the State.

Easily known by the change of the flesh to red, which color fresh plants immediately show when broken. This character is said to be found also in the seashore mushroom, *P. halophila* Pk. which has a solid stem and has not been found inland. Peck says its flavor when cooked is similar to *P. campestris,* and gives to the milk in which it is stewed a brownish color. Ricken considers it a mere form of *P. silvatica,* but describes the latter differently from most authors. It is certainly distinct.

232. Psalliota micromegetha Pk. (Edible)

N. Y. State Mus. Rep. 54, 1901. (As *Agaricus pusillus*).

Illustration: N. Y. State Mus. Bull. 116, Pl. 107, Fig. 1-6, 1907.

"PILEUS 2-7 cm. broad, fragile, convex becoming plane, sometimes subdepressed in center, dry, *silky-fibrillose or fibrillose-scaly, grayish-brown or brown in center,* often with yellowish or ferrugi-

nous stains. FLESH white or whitish, *not changing color where wounded.* GILLS free, close, *grayish at first,* soon pinkish, finally brown. STEM 2-5 cm. long, 6-10 mm. thick, equal or slightly tapering upward, sometimes bulbous, stuffed or hollow, slightly fibrillose, white. ANNULUS *slight,* often evanescent. SPORES broadly elliptic or subglobose, 5 x 4 micr. Edible."

Solitary or caespitose, on grassy ground, in sandy or clay soil. September-November. Detroit.

The description is adapted from the revised one in N. Y. State Bull. 116, p. 44, 1907. The original description was made largely from smaller plants sent to Peck from Detroit by Dr. R. H. Stevens, and named *Agaricus pusillus;* later the name was changed to that given above, meaning small to large in size. I have not seen it.

233. Psalliota comtula Fr. (Edible)

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 130.
Cooke, Ill., Pl. 533.
Ricken, Blätterpilze, Pl. 62, Fig. 1 (as *P. rusiophylla*).
Atkinson, Mushrooms, Fig. 24, p. 25, 1900.

PILEUS 2-4.5 cm. broad, convex-subexpanded, subumbonate or umbo obsolete, silky, creamy-white to grayish-white, *tinged with yellowish hues on disk,* sometimes rufous-tinged. FLESH whitish, becoming ochraceous under cuticle, thickish on disk. GILLS free, broader in front, narrowed behind, up to 5-6 mm. broad, dingy incarnate, at length smoky-umber. STEM 3-5 cm. long, 2.5-5 mm. thick, subequal, hollow, innately silky, pallid or slightly yellowish-stained. ANNULUS *median,* membranaceous, thin, whitish, often *subevanescent.* SPORES 5-6 x 3-3.5 micr., elliptical, smooth, dark purple-brown. BASIDIA 20 x 6 micr. STERILE CELLS on edge of gills inflated-clavate. ODOR not marked.

On the ground among fallen leaves in pine and beech woods. New Richmond. September. Infrequent.

The description shows a slight variation from that of other authors. Atkinson gives the spore measurements 3-4 x 2-3 micr. Ricken considers Fries' plant as identical with *P. rusiophylla* Lasch, and also gives small spores and basidia. Except for the pale color of the cap, our plants could be referred to Ricken's *P. sagata* Fr. The species needs further study.

234. Psalliota diminutiva Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

Illustrations: N. Y. State Mus. Rep. 54, Pl. 74, Fig. 1-8, 1901.
Plate L of this report.

PILEUS 2-5 cm. broad, fragile, *convex then plane,* sometimes subdepressed, silky-fibrillose, the *fibrils forming delicate, pinkish-drab to reddish-brown scales toward center and on disk,* paler and denuded on margin, white or tinged gray under fibrils, not striate. FLESH thin, whitish. GILLS free, not remote, thin, close, moderately broad, ventricose, *edge entire.* STEM 3-5 cm. long (rarely longer), 2-5 mm. thick, equal or tapering upwards, stuffed by delicate white pith then hollow, glabrous, innately silky, even, whitish, sometimes subbulbous at base. ANNULUS delicate, thin, rather persistent, narrow, whitish. STERILE CELLS on edge none. BASIDIA 27 x 5-6 micr., 4-spored. ODOR and TASTE none.

Solitary or gregarious on mossy ground, or among leaf-mould in low moist frondose or mixed woods. Throughout the State. August-September (rarely in spring). Frequent.

This dainty little Psalliota is known by its delicate pinkish or reddish fibrils on the cap, the entire gills and persistent annulus. It is not supposed to possess, like the preceding, the yellowish stains on cap and base of stem, but specimens are found which have this character which do not seem to belong elsewhere. As they are rather scattered in occurrence no sufficient study has been made of these forms. It may be that several little species run into each other. Peck says they are very palatable when fried in butter, but their small size does not attract the collector who is looking for a meal.

235. Psalliota echinata Fr.

Syst. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 155 (as Pholiota).
Cooke, Ill., Pl. 395 (as Inocybe).
Ricken, Blätterpilze, Pl. 31, Fig. 6 (as Inocybe).
Montagne, in Ann. Sci. Nat. 1836, Pl. 10, Fig. 3 (as *Agaricus oxyosmus*).

PILEUS 1-3 cm. broad, obtusely campanulate then expanded, margin at first incurved and somewhat appendiculate, then recurved, densely covered with smoky-brown, minute-floccose, wart-like or

pointed scales, not striate, sometimes rimose in age. FLESH whitish at first, *then reddish,* thin. GILLS free, thin, narrow, crowded, bright pink to old rose-color, *finally dark purplish-red.* STEM 2-3 cm. long, 1-3 mm. thick, equal, stuffed with loose white fibrils then tubular, *elsewhere soon blood-red within,* surface floccosely-pulverulent with a smoky bloom below the annulus, often mycelioid-swollen at base. VEIL floccose-submembranaceus, easily lacerated, concolor, forming an imperfect ANNULUS. Spores minute, elliptical, 4-5 x 2-2.5 micr., smooth, *with a tinge of purple-brown* under microscope, many immature and hyaline, *cinnabar-purple brown in mass.* CYSTIDIA none. *Trama* of gills composed of large cells, about 20 micr. in diameter. ODOR and TASTE slight, not of cucumber, even after crushing.

Subcaespitose or gregarious, in a green-house of the Michigan Agricultural College, East Lansing. September. Rare.

As shown by the references, this plant has been placed in three different genera. It is therefore difficult of identification, the more so because of its rarity. It seems that the spores mature slowly, or perhaps in some regions or under hot-house conditions do not take on a purplish tinge. Under the microscope some of the spores of our specimens showed the usual delicate tint in the exospore which is characteristic of many of this group. Fries (in Hymen. Europ.) says he never saw them rosy. Patouillard says they are hyaline under the microscope but that on a white background they appear tawny ("fauve"). Ricken applies the word "erdfarbig." All the illustrations picture our plant well, which, to quote Berkeley, "is a most curious species." In Europe it occurs in hot-houses almost exclusively.

Stropharia Fr.

(From the Greek, *strophos,* a sword-belt, referring to the annulus.)

Purple-brown-spored. Stem fleshy, *confluent with the pileus;* annulus membranous or fibrillose-floccose. Gills *attached.* SPORES purple-brown or violet. Pileus usually *viscid.*

Putrescent, terrestrial or coprinophilous, of medium size, in fields, barnyards, dung hills or forest. They correspond to Armillaria of the white-spored, and Pholiota of the ochre-brown-spored groups in the adnate gills and annulate stem; differing from Hypholoma in that the veil collapses on the stem to form an annulus, instead of remaining as a fringe on the margin of the pileus.

It would be preferable, in my judgment, to limit the genus to

those species with a viscid pellicle; but with the data at hand it seems best to defer this arrangement. Ricken divides the genus by the size of the spores, but this method neglects other more important morphological characters. On the other hand, some species could be better located in the genus Hypholoma as is done by Ricken for *S. caput-medusae* Fr., *S. scobinaceum* Fr. and *S. battarae* Fr. There are then two sections: Viscipelles and Spintrigeri.

Key to the Species

(a) Pileus with bluish-green or olive shades, viscid.
(b) Stem 4-7 mm. thick, greenish-blue; pileus thick, green; on debris in woods. 236. *S. aeruginosa* Fr.
(bb) Stem 1.5-2 mm. thick, long and slender; pileus thin, olvaceous-gray; on dung and mud. (See 268. *Psilocybe uda* Fr.)
(aa) Pileus without green or olive.
(b) Stem ventricose-radicating; pileus umber to tawny-alutaceus, viscid. 237. *S. ventricosa* Mass.
(bb) Stem not radicating.
(c) Parasitic on Coprinus, whitish. 244. *S. epimyces* (Pk.) Atk.
(cc) Not parasitic; pileus viscid or subviscid.
(d) Growing on dung.
(e) Pileus citron-yellow, 2-5 cm. broad; common.
(f) Pileus persistently hemispherical. 242. *S. semiglobata* Fr.
(ff) Pileus convex-subexpanded. 241. *S. stercoraria* Fr.
(ee) Pileus ochraceous-brown, 1-2.5 cm. broad, conic-campanulate. 243. *S. umbonatescens* Pk.
(dd) Not on dung.
(e) Pileus 5-10 cm. broad, cinnamon-drab, viscid, stem squarrose-scaly. 238. *S. depilata* Fr.
(e) Pileus 1-4 cm. broad.
(f) Gills strongly violet-purplish; pileus ochraceous-pallid. 240. *S. coronilla* Bres.
(f) Gills strongly gray-tinged; pileus white to buff. 239. *S. albonitens* Fr.

Section I. Viscipelles. Pileus provided with a distinct gelatinous pellicle, hence viscid; glabrous or scaly.

**Growing on the ground or on debris.*

236. Stropharia aeruginosa Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 551.
Gillet, Champignons de France, No. 650.
Ricken, Blätterpilze, Pl. 63, Fig. 4.
Pattouillard, Tab. Analyt., No. 231.
Swanton, Fungi, Pl. 38, Fig. 7-9.
Harper, Wis. Acad. Sci. Trans., Vol. 17, pt. II, Pl. 64, 1913.

PILEUS 2-5 cm. broad (often rather small in our climate). Campanulate-convex, at length plane, subumbonate, *covered with verdigris-green, thick gluten,* hence viscid, sometimes dotted with scattered, white scales, especially on margin, at length fading to yellowish, pellicle separable. FLESH pallid, or tinged blue, rather soft, thickish. GILLS broadly adnate, sometimes emarginate-sinuate, rather broad, close, whitish at first, soon drab-gray or reddish-gray, finally purplish-chocolate-brown, *edge white and minutely flocculose.* STEM 5-7 cm. long, 4-7 mm. thick, equal, hollow, soft, *greenish-blue, viscid,* at first scaly or fibrillose below the annulus. ANNULUS distant from apex, narrow, submembranous, here and there floccose, subevanescent. SPORES pale, smooth, 7-8 x 4-5 micr., oval-elliptical. STERILE CELLS on edge of gills, clavate, lanceolate.

On debris in hemlock woods, and occasionally in frondose woods. Houghton, New Richmond, Detroit. August-October. Infrequent.

Although this is a brightly colored and striking plant, we have come across it infrequently, but in Europe it is said to be very common in forest, field and garden. The gills sometimes run down the apex of the stem in lines. The annulus is sometimes lacking. Our plants are well shown by the figures of European authors, and seem to agree perfectly. It is said to be *poisonous.* It is probably more common northward.

237. Stropharia ventricosa Massee

British Fungus Flora, Vol. I, p. 400, 1892.

Illustration: Cooke, Ill., Pl. 1188 (as *S. merdaria* var. *major*).

PILEUS 3-5 cm. broad, parabolic then convex-expanded, margin for long time decurved, *very viscid,* somewhat uneven when young, glabrescent and shining *pale umber at first, then tawny-alutaceus.* FLESH white, thick on disk, abruptly thin on margin. GILLS adnate, at length decurrent by tooth, close, *rather narrow,* pallid at first, then mouse-gray with purplish tinge, finally purplish-brown. STEM 8-12 cm. or more long, *ventricose-radicating,* up to 15 mm. thick at broadest part, thinner above, rooting-attenuate at base, sometimes subequal, white at first, becoming dingy yellowish, dry, *covered up to the annulus by squarrose scales,* markedly striate above, stuffed, whitish within. ANNULUS persistent, white, large, striate above. SPORES 9-12 x 5-6 micr., elliptical, smooth, with a purple tinge under the microscope, brown in mass. CYSTIDIA

oval or short ventricose, obtuse at apex, about 45 x 24 micr., hyaline.

Caespitose on very decayed debris about stumps and roots in forest of hemlock, maple, etc. Bay View. September. Rare.

This has very much the stature of Cooke's figure of *Pholiota radicosa* (Ill., Pl. 361) and grows in similar places, but the pileus of our plants has a glabrous, viscid pellicle, and the spores are purple-tinged. The odor was not noted. The root-like prolongation pushes deep down into the debris and the mycelium was attached to dead roots. This agrees so well with Massee's description that I have ventured to refer it thither, in spite of its larger size and more scaly stem.

238. Stropharia depilata Fr.

Hymen. Europ., 1874.

Illustrations: Harper, Trans. Wis. Acad. Sci., Vol. 16, Pl. 62 and 63, 1913.

PILEUS 4-12 cm. broad, firm, convex to plane or broadly umbonate, obtuse, glabrous, *viscid,* light cinnamon-drab (Ridg.) when young and *with a smoky tinge,* at length dark olive-buff or pinkish-buff (Ridg.), even on the decurved margin which is sometimes appendiculate when young. FLESH whitish, thick except the thin margin. GILLS adnate, often subdecurrent and running down the stem in lines, close to crowded, broad, pallid at first, *soon pale purple-drab* (Ridg.) or *ashy,* at length purplish-black. STEM 6-12 cm. long, 8-15 mm. thick, subequal or subventricose, stuffed, whitish within and without, becoming yellowish-tinged, *clothed below annulus by subsquarrose, lacerate, fibrillose or floccose whitish or creamy-yellow scales,* apex glabrescent, often deeply immersed at base. ANNULUS distant, membranous, persistent, at first white, firm and erect, then deflected and clove-brown (Ridg.). SPORES elliptical, smooth, 9-12 x 5-6.5 micr., dark-gray with tint of purple under microscope. CYSTIDIA none. Edge of gills with sterile cells. ODOR none. TASTE tardily disagreeable.

Solitary or subgregarious, rarely subcaespitose; among debris or about logs and stumps in mixed woods of balsam, spruce, birch, etc. Northern Michigan. Frequent locally. September-October.

The large size, scaly stem and slate-gray gills are the striking characteristics of this species. Harper reports it from Neebish Island. It is also an inhabitant of the Adirondack Mountains,

where I have collected it. It seems to fruit preferably in the autumn and in dry weather.

239. Stropharia albonitens Fr. (Suspected)

Monographia, 1863.

Illustrations: Fries, Icones, Pl. 130, Fig. 2.
Ricken, Blätterpilze, Pl. 63, Fig. 3.

PILEUS 1-3 cm. broad, *campanulate,* then plane-subumbonate, with a *viscid* pellicle, *white to buff,* sometimes yellowish-tinged on disk, becoming gray on margin, shining when dry, glabrous, even. FLESH white, moist, thin. GILLS adnate becoming emarginate, *subdistant,* rather broad, ventricose, *gray to purplish-gray* then darker, edge minutely white-fimbriate. STEM elongated, 3-7 cm. long, 2-3 mm. thick, equal, stuffed with a white pith then hollow, whitish, *tinged yellow in age,* yellowish within, dry, pruinose or flocculose. ANNULUS superior, white, evanescent, soon colored by spores. SPORES 7-9 x 4-5 micr., elliptical, smooth, purple-brown in mass. CYSTIDIA. ODOR none.

On the ground in open, grassy woods. Ann Arbor. October.

Known by the gray color of the gills and the yellowish tinge to the stem in age.

240. Stropharia coronilla Bres. (Suspected)

Fung. Trid., Vol. I, 1881 (Fr., Syst. Myc., 1821).

Illustrations: Ricken, Blätterpilze, Pl. 63, Fig. 5.
Patouillard, Tab. Analyt., No. 232.
Cooke, Ill., Pl. 535.

PILEUS 2-4 cm. broad, convex-expanded, subviscid, even, *ochraceous-whitish,* glabrous, subpruinose when dry. FLESH white, rather thick. GILLS adnate, rounded behind or sinuate, ventricose, close, moderately broad, *fuscous-violaceous then purple-blackish,* edge white-fimbriate. STEM 3-4 cm. long, 3-5 mm. thick, equal or slightly tapering upward, stuffed then hollow, dry, white, minutely flocculose above the annulus, fibrillose below then shining. ANNULUS thickish-membranous, *persistent,* distant from apex, *striate above.* SPORES 8-9.5 x 4-5 micr., elliptic-ovate, violet-purple under microscope, smooth. CYSTIDIA short, broadly clavate, round-

ed but apiculate above. ODOR slight, unpleasant. On the ground in woods of white pine and beech. New Richmond. September. Infrequent.

This differs from *S. albonitens* in the strong violet color of gills and spores. The cap is more ochraceous and more convex. The gills are more crowded. This seems to be closely related to *S. melasperma* Fr., and the cystidia figured for that species by Patouillard (Tab. Analyt., No. 555) are characteristic of our specimens. *S. bilamellata* Pk. is a much larger plant, with larger spores, and the thick annulus has radiating gill-like ridges on its upper surface. (See Peck, Pl. 112, Fig. 5-10, N. Y. State Mus. Bull. 122, 1908 and Harper, Wis. Acad. Sci. Trans., Vol. 17, Pt. II, Pl. 65.)

***Growing on dung.*

241. Stropharia stercoraria Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 538.
Harper, Trans. Wis. Acad. Sci., Vol. 17, Pt. II, Pl. 67.

PILEUS 2-6 cm. broad, convex-hemispherical, *then broadly convex or subexpanded,* viscid from the separable, gelatinous pellicle, glabrous, even, *citron-yellow,* buff or whitish when dry, often stained by the spores. FLESH white or tinged yellow, thin on margin, soft. GILLS adnate at length subdecurrent, *very broad,* close, umber-fuscous to purplish-olivaceous or blackish, *edge white flocculose.* STEM 6-18 cm. long, 2-6 mm. thick, *elongated-cylindrical,* stuffed by white pith then hollow, base thicker, yellowish-white, covered up to the evanescent, narrow *annulus* by the floccose-scaly thin remains of a membranaceus veil. SPORES large, elongated-elliptical, 15-21 x 8-12 micr., variable in size, smooth, violet-purple under microscope, blackish-purple in mass. "CYSTIDIA *on the sides* and edge of the gills, lanceolate, 50-70 x 12-18 micr." (Ricken.) TASTE of pellicle slightly bitter.

On dung hills, manure piles or similar places; gregarious.

Throughout the State. May-October. Common, apparently more common than the next, at least in southern Michigan.

So close in appearance to *S. semiglobata* that they are difficult of easy separation. *S. stercoraria* is apparently almost limited to dung or manure, while the other has a wider range. It differs microscopic-

ally according to Ricken, by the presence of cystidia which occur also on the sides of the gills and which are absent in *S. semiglobata* except on the edge. The pileus of the latter is more persistently hemispherical. *A sterile form* has been observed, in every particular like the above, except that the gills remained pale yellow or straw-color; spores were lacking at full expansion of the pileus and the hymenium was composed of large, inflated, sterile cells in place of the basidia.

242. Stropharia semiglobata Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 539.
Gillet, Champignons de France, No. 651.
Patouillard, Tab. Analyt., No. 234.
Ricken, Blätterpilze, Pl. 63, Fig. 2.
Atkinson, Mushrooms, Fig. 30, p. 31, 1909.
Hard, Mushrooms, Fig. 260, p. 320, 1908.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 3.

PILEUS 1-4 cm. broad, *persistently hemispherical,* very viscid from the pellicle, glabrous and naked, even, citron-yellow, shining when dry, faded in age, stained purplish-black by spores. FLESH thick on disk, thin on margin, pallid, soft. GILLS broadly adnate, *very broad,* close to subdistant, olive-gray to purplish-brown, clouded blackish, edge minutely white floccose. STEM 5-12 cm. long, 2-5 mm. thick, subequal or cylindrical, straight, *hollow,* rigid, often viscid when young or fresh, covered below up to the narrow annulus by the thin, membranous, flocculose veil. SPORES elliptical, 15-18 x 9-10 micr., smooth, violet-purple under the microscope, brownish-purple in mass. CYSTIDIA *only on edge of gills,* short-filamentous, 30-45 x 3-4 micr. (Ricken.)

On dung hills and grassy places in the open. Probably throughout the State. May-October. Frequent.

See notes on the preceding.

243. Stropharia umbonatescens Pk. (Suspected)

N. Y. State Mus. Rep. 30, 1878.

Illustrations: Harper, Wis. Acad. Sci. Trans., Vol. 7, Pt. II, Pl. 65, B.
Plate LI of this Report.

PILEUS 1-2.5 cm. broad, *conico-campanulate,* at length more or less mammilately umbonate, with a viscid pellicle, pale ochraceous-brownish or grayish on margin, *umbo bright ochraceous brown to reddish-brown,* even or obscurely substriate, shining, glabrous. FLESH thin, pallid. GILLS adnate to adnate-decurrent, *broad to subtriangular,* close, at first whitish then gray, finally purplish-brown to blackish. STEM 5-10 cm. long, slender, equal, stuffed then hollow, toughish, *pallid, tinged ochraceous,* covered at first by thin, obscure, scaly remnants of the veil up to the fugacious ANNULUS. SPORES 17-19 x 10 micr., elliptical, smooth, purple-brown under microscope, dark purplish in mass. ODOR *often strong of radish or foetid.*

Gregarious on dung hills or about manure heaps. September-October. Ann Arbor. Not infrequent.

Much more slender and with a thinner, smaller cap than the two preceding; also, the cap is very different in shape. Its rather foetid odor and large spores distinguish it from others. It is close to *S. paradoxa* P. Henn. in the shape of pileus and size of spores.

Section II. Spintrigeri. Pileus without a distinct pellicle, usually innately fibrillose, not viscid.

244. Stropharia epimyces (Pk.) Atk.

Plant World, Vol. X, Figs. 21-24, p. 121, 1907.
N. Y. State Mus. Rep. 35, 1884 (as *Panoeolus epimyces* Pk.).
Jour. Mycol., Vol. 8, 1902 (as *Stropharia coprinophila* Atk.).

Illustrations: Atkinson, Plant World.
Hard, Mushrooms, Fig. 227, p. 341, 1908 (as Panoeolus).
Miss Sherman, Jour. Mycol., Vol. II, Pl. 80, opp. p. 169, 1905 (as Panoeolus).

PILEUS 2-6 cm. broad, rarely larger, at first globose-oval, then convex-expanded, sometimes margin is elevated in age, silky-fibrillose, *white* then dingy, even, margin at times appendiculate. FLESH thick except the thin margin, white. GILLS narrowly adnate, rather narrow, broader in front, close, thin, grayish at first then blackish-brown, *edge white-fimbriate.* STEM 2-7 cm. long, 5-15 mm. thick, fleshy, equal or tapering upward, solid-stuffed then hollow, soft, flocculose-mealy, striate, *white-annulate near the base* from the white floccose-veil, often abruptly obconic at base where it is inserted in the depression (often volva-like) of the host mushroom. SPORES oval-elliptical, 7-8.5 x 3.5-5 micr., smooth, *dark purple-*

brown under microscope, almost black in mass. CYSTIDIA on sides and edge of gills, clavate or subventricose on a slender stalk, obtuse at apex, 40-60 x 10-14 micr., abundant on edge. BASIDIA 25-35 x 7-9 micr., 4-spored. ODOR and TASTE mild.

Parasitic, from one to seven on the host; on *Coprinus atramentarius* and *Coprinus comatus.*

Ann Arbor, Detroit, Port Huron. September-November. Infrequent.

This curious Agaric, like *Nyctalis asterophora* and the European *Volvaria loveiana,* seems to have no other home than on the foundation furnished by some species of another Agaric. Rumors have come to me that it occurs also on *C. micaceous,* but no specimens have been seen. It is distributed over northeastern North America, having been seen in the states of New York, Michigan, Wisconsin, Minnesota and by Dr. Pennington in Canada as far west as Winnipeg. It is a good Stropharia, although at first referred by Peck to Panoeolus with a suggestion that it might be put under Hypholoma. As Atkinson has shown (Plant World), the nature of the veil and annulus and the purple tinge to the spores are Stropharia characters. The host mushrooms are deformed and may not develop sufficiently to be recognized. Excellent specimens were received from Mr. A. W. Goodwin of Port Huron. Harper has pointed out (Mycologia, Vol. 5, p. 167) that the figures of an European species, *Pilosace algeriensis* Fr., by Lanzi (Fung. Mang., Pl. 67, Fig. 3) may represent our plant. An examination of these figures has convinced me that there is a probability that they illustrate our species. It remains very doubtful, however, whether Lanzi's plant when fresh had free gills. In any case, our plant is not a Pilosace, although collectors may disagree as to whether it is a Stropharia or a Hypholoma.

Hypholoma Fr.

(From the Greek, *hypha,* a web, and *loma,* a fringe; referring to the fringe left by veil on margin of pileus.)

Purple-brown-spored. Stem fleshy, confluent with the pileus; gills *adnate-seceding.* Veil *breaking away from the stem, leaving shreds or a silky border on the margin of the pileus,* flocculose-fibrillose. Margin of pileus at first incurved.

Putrescent fungi, growing on decaying wood or on the ground, often very caespitose around stumps or decayed roots of trees. The

genus corresponds to Tricholoma of the white-spored group, in the lack of a true annulus and by the attached gills. Many of the Hypholomas are, however, much thinner and more fragile than the Tricholomas. It differs from Stropharia and Psalliota in that the veil which is cortinate remains as a fringe on the margin of the pileus instead of forming an annulus on the stem. It is more difficult to separate the thin-capped species from Psilocybe. The latter differs in some cases only in a relative sense. The cortina-like veil in Psilocybe is only very slightly developed and leaves no shreds on the margin of the pileus or on the surface as in the hygrophanous species of Hypholoma. An account of the development of *H. sublateritium* by Miss Allen (Ann. Myc., Vol. 4, p. 387, 1906) shows that the young button is surrounded by a universal veil. This is probably also true of the hygrophanous species where this outer veil often leaves flocculent particles on the surface of the young cap.

The genus is divided into two sections whose species are notably different in their general appearance and the texture of the flesh. In the first section the PILEUS is thick, compact and firm; in the second, it is rather thin, somewhat fragile and soft. The former have usually brighter colors, while the latter are brownish, gray or white. The GILLS vary much in color during the course of their development. This character is often used to separate the species, but is less reliable for the purpose than in the genus Cortinarius. The STEM is fleshy, and in the fragile forms it is soon hollow. The SPORES are elliptical except in *H. populina* Britz. var., where they are variously shaped. In *H. velutinum* and *H. rugocephalum* they are more or less tuberculate. Many species have CYSTIDIA on the sides of the gills, or sac-shaped sterile cells on the edge. The large fleshy ones are *edible,* although at times they develop a disagreeable bitter taste. This is thought by some to be due to the passage of the larvae of insects through the flesh; needless to say, such bitter plants should not be eaten. Of the thin ones, *H. incertum* and allied forms are much sought after.

Key to the Species

(A) Pileus firm, compact, not hygrophanous, dull reddish or yellow; caespitose.
  (a) Pileus dark brick-red, especially on disk.
    (b) Gills at first whitish. 245. *H. sublateritium* Fr.
    (bb) Gills at first yellow. 245. *H. sublateritium* var. *perplexum* Pk.
  (aa) Pileus yellow or yellowish; no red.
    (b) Gills at first sulphur-yellow, soon green. *H. fasciculare* Fr.
    (bb) Gills at first pallid, never with green shades.
      (c) Gills gray or smoky gray. *H. capnoides* Fr.

(cc) Gills purple-gray, at length coffee-brown; stem long-radicating. *H. epixanthium* Fr.

(AA) Pileus rather fragile, sometimes hygrophanous, rarely red or yellow.

(a) Pileus viscid, small, bay-brown. 246. *H. peckianum* sp. nov.

(aa) Pileus not or slightly viscid.

(b) Stem with a wine-colored juice when broken. 250. *H. vinosum* sp. nov.

(bb) Stem not with a colored juice.

(c) Pileus with innate hairy or fibrillose scales.

(d) Pileus 1-3 cm. broad, with umber-brown hairy scales; spores irregular; gregarious-scattered. 249. *H. populinum* Britz. var.

(dd) Pileus 3-10 cm. broad; caespitose.

(e) Pileus whitish, dotted with brownish scales. 247. *H. lachrymabundum* (Fr.) Quel.

(ee) Pileus tawny to yellowish; gills often beaded on edge. 248. *H. velutinum* (Fr.) Quel.

(cc) Pileus soon glabrous and naked.

(d) Pileus 6-10 cm. broad, rugose, subviscid. 251. *H. rugocephalum* Atk.

(dd) Pileus not over 6 cm. broad, hygrophanous.

(e) Growing on lawns, fields or other grassy places, rarely in woods; densely gregarious-subcaespitose. 252. *H. incertum* Pk.

(ee) In woods, swamps, thickets, etc.

(f) Caespitose around stumps, etc.

(g) Pileus when moist watery dark brown; gills at first grayish-brown; spores minute. 255 and 256. *H. hydrophilum* Fr.

(gg) Pileus when moist honey-brown; gills at first persistently whitish. 253. *H. appendiculatum* Fr.

(ff) Gregarious-scattered, singly; gills narrow.

(g) Pileus 4-7 cm. broad, umber-brown when moist; gills very narrow. 254. *H. coronatum* Fr.

(gg) Pileus 1-3 cm. broad, pale watery brown when moist; very fragile. 257. *H. saccharinophilum* Pk.

(ggg) Pileus 3-6 cm. broad; pale honey brown when moist; stem 5-10 cm. long. 252. *H. incertum* var. *sylvestris.*

Section I. Fascicularia. Pileus fleshy, naked and glabrous, *margin at first silky,* brightly colored, not hygrophanous.

**Large, caespitose: pileus not viscid.*

245. Hypholoma sublateritium Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 577.
Gillet, Champignons de France, No. 357.
Atkinson, Mushrooms, Fig. 25, opp. p. 26, 1900.
Marshall, The Mushroom Book, Pl. 29, opp. p. 81, 1905.

Reddick, Ann. Rep. Geol. & Nat. Res. Ind. 32, p. 1231, Fig. 11, 1908.

Murrill, Mycologia, Vol. 1, (as *H. perplexum*).

Plate LI of this Report.

PILEUS 3-8 cm. broad, *firm,* convex-expanded, obtuse, *dark brick-red,* darker on disk, paler on margin, even, glabrous, naked except the decurved margin, which is white-silky from the veil. FLESH thick, *compact,* whitish, in age slightly yellowish. GILLS adnate, crowded, narrow, *at first whitish, then grayish to sooty-olive,* finally dark purplish-brown, edge minutely white-crenulate. STEM 8-12 cm. long, rather stout, 5-12 mm. thick, equal or attenuated downward, stuffed, whitish above, *ferruginous below,* floccose-fibrillose, glabrescent, ascending or curved from the crowded insertions. SPORES 6-7 x 3-4 micr., oblong-elliptical, smooth, purple-brown, blackish purple in mass. BASIDIA about 24 x 5 micr., 4-spored. CYSTIDIA few or scattered, obclavate with apiculate apex, 36 x 12 micr.; *sterile cells* on edge, shorter, inflated. ODOR none. TASTE mild or bitterish.

Very caespitose, forming large clusters in autumn, growing from the base of trees or stumps or on buried roots, etc.

August-November. Throughout the State. Very common.

Var. *perplexum* Pk. has the *gills yellow at first,* finally dark purple-brown, intermediate stage with olive tints. The STEM becomes hollow. The PILEUS has more yellow on the margin. SPORES etc. the same as in *H. sublateritium.*

This species is widely distributed and common in autumn. It is easily recognized by its dark brick-red cap, by the compact, thick flesh and caespitose habit. It is quite variable, and Peck seems to have based his species *H. perplexum* (N. Y. State Cab. Rep. 23, 1872) on such a variation. The conditions of weather, the nature of the wood and other factors no doubt produce some of these forms. An effort has been made by Peck, followed by McIlvaine (see the latter, p. 355, 1900) to provide a key for the separation of these two and of related European species. In the southern part of the state I have examined many clusters for the purpose of verifying this key but found that the mild or bitter taste, the stuffed or hollow stem, and the various shades of color which the gills possess during the process of maturing, were so variable and unreliable that no distinct species could be separated by them. I have not met the other European species: *H. capnoides, H. epixanthium* and *H. fasiculare,* which lack the *red* color of the pileus of our plants, and

all of which are described with caps colored some shade of yellow.

Our plant is *edible,* and is eaten by many with safety and relish. In Europe, the same species is said to be poisonous, and is so marked by Ricken in the latest, extensive work of that country.

***Pileus viscid.*

246. Hypholoma peckianum sp. nov.

PILEUS 1-2 cm. broad, convex, obtuse, subexpanded, *viscid,* glabrous, *bay-brown,* blackish on disk, paler on margin, even, margin bordered by white, silky fibrils from the veil. FLESH whitish, moderately thin, thicker on disk. GILLS adnate, rounded behind, 2-3 mm. broad, abruptly narrower in front, close, *at first flesh-colored* then dark purplish-brown, edge *white-fimbriate.* STEM 3-4 cm. long, 2-2.5 mm. thick, equal, white-floccose above, innately fibrillose elsewhere, *pallid to brownish,* brown within except the white pith, at length hollow, flexuous. SPORES 10-12 x 5-6 micr., ventricose-elliptical, pointed at ends, smooth, tinged purple under the microscope, purplish-brown in mass. CYSTIDIA none. STERILE CELLS on edge of gills, *clustered,* linear-cylindrical, obtuse, about 20 x 4 micr. BASIDIA subcylindrical, 30 x 6 micr., 4-spored. ODOR and TASTE none.

Scattered on debris of leaves and decayed wood in woods of hemlock, beech, maple, etc. New Richmond. September. Rare.

The viscid, dark-colored cap, the flesh-colored young gills and the small size, distinguish the species. The cortina is white and distinctly fibrillose.

Section II. Limbata. Pileus somewhat fleshy or thin, at first innately fibrillose or dotted with superficial floccose scales on the surface or margin.

This group approaches the genus Psilocybe, but the veil is always recognizable under favorable weather conditions by the series of floccose remnants which border the margin of the fresh pileus; in wind and rain these rapidly disappear. In most of the species the remnants of the veil are scattered over the surface of the very young pileus as superficial flocculent particles or minute scales; these usually disappear early. In other species the veil remains hanging to the margin of the pileus in an appendiculate manner.

**Pileus innately hairy, fibrillose-scaly or velvety.*

247. Hypholoma lachrymabundum (Fr.) Quel. (Edible)

Syst. Myc., 1821 (Pro parte); Jura et. Vosges, 1872.
(See Maire, Soc. Myc. de France, Bull. 27, p. 441, 1911).

Illustrations: Fries, Icones, Pl. 134, Fig. 1.
Cooke, Ill., Pl. 543 (as *H. storea* var. *caespitosa*).
Quelet, Bull. Soc. Bot. France, Vol. 23, Pl. 2, Fig 5 (as *Stropharia cotonea*).
Plate LII of this Report.

PILEUS 4-10 cm. broad, convex then campanulate, obtuse or discoid, *ground-color whitish to buff,* then pale brownish-ochraceous, moist, covered except on disk by *scattered, rather large appressed brownish hairy scales,* paler on margin, not striate, margin at first incurved and appendiculate from the thickish, floccose-white veil, sometimes rugulose on disk. FLESH thick, thin on margin, firm, white. GILLS adnate-seceding, narrow, crowded, at first whitish, at length purplish-brown, edge white-flocculose, sometimes distilling bead-like drops. STEM 6-12 cm. long, 5-10 mm. thick, equal, hollow, striate above, fibrillose or subscaly below, glabrescent, *whitish* then sordid, base sometimes stained yellowish when bruised, white-mycelioid at base. SPORES 6-7.5 x 3-4 micr., elliptical, slightly curved, smooth, dark brownish-purple under microscope. CYSTIDIA on sides and edge of gills short, rather abundant, 30-40 x 12-15 micr., ventricose.

Densely caespitose at or about the base of trees, in beech, maple and birch woods of conifer regions. Bay View, Houghton. August-September. Rather rare.

This differs from *H. velutina* (which is the *H. lachrymabundum* of most books) in the whitish color, paler gills at first, the small spores and different cystidia. According to Maire (l. c.) the two species were originally combined by Fries, and later segregated by Quelet. It has been described under various names and much confusion has resulted. The unravelling of the tangle is due to Prof. Maire, with the result that the species ordinarily called *H. lachrymabundum* in this country is really *H. velutina. H. aggregatum* Pk. is in my opinion only a smaller form of the same plant. The gills of this species are rarely found "weeping," although in *H. velutina* they are usually "beaded with drops."

248. **Hypholoma velutinum** (Fr.) Quel. (Edible)

Syst. Myc., 1821; Jura et. Vosges, 1872.
(See Maire, Soc. Myc. de France, Bull. 27, p. 144, 1911).

Illustrations: Cooke, Ill., Pl. 563.
Gillet, Champignons de France, No. 358.
Gillet, Champignons de France, No. 356 (as *H. lachrymabundum*).
Patouillard, Tab. Analyt., No. 117 (as *H. lachrymabundum*).
Berkeley, Outlines, Pl. 11, Fig. 2.
Atkinson, Mushrooms, Fig. 28, p. 29, 1900 (as *H. lachrymabundum*).
Hard, Mushrooms, Figs. 263-264, pp. 325-326, 1908 (as *H. lachrymabundum*).
Plate LIII of this Report.

PILEUS 3-10 cm. broad, convex then broadly campanulate, sometimes obtusely umbonate, finally plane, at first covered by a hairy tomentum, *then appressed fibrillose-scaly,* not striate, *tawny to yellowish,* darker to umber on center, sometimes radially rugulose, margin at first appendiculate from the veil, at length split. FLESH thick on disk, soft, watery-brown to sordid yellowish. GILLS adnate-seceding, broad behind but sinuate, narrowed toward front, crowded, not reaching margin of pileus, *at first pale yellowish then umber* and dotted by spore masses, edge white-flocculose, *beaded with drops.* STEM 2-8 cm. long, variable in length, 4-10 mm. thick, equal, soon hollow, fibrillose to floccose-scaly and tawny up to the obsolete annulus, whitish above; *veil* soft-fibrillose, soon breaking, dingy, white, remnants clinging to the margin of the pileus. SPORES oval to broadly elliptical, 9-12 x 7 micr., *tuberculate,* dark purplish-umber under microscope. CYSTIDIA few or scattered on sides of gills, cylindrical, in groups of several, about 60 x 9-10 micr., abundant on edge, cylindrical-subcapitate, 45-55 x 6-7 micr. ODOR and TASTE earthy.

Caespitose, scattered or solitary on alluvial soil or swampy grounds in woods. Throughout the State. July-October. Frequent.

This is the *H. lachrymabundum* Fr. of most authors. See notes on the preceding. It is distinguished by its tawny or darker color, very characteristic, tuberculate spores and cylindrical cystidia. The gills usually distil drops from their edge in moist weather. These drops are often dark colored from the spores, hence Fries

remarks that the edge is "nigro-punctate." Peck (N. Y. State Mus. Bull. 150, p. 81, 1911) has given (under *H. lachrymabundum*) spore measurements which are misleading; and the rest of the description applies to extreme forms.

249. Hypholoma populinum Britz. var.

Bot. Centralbl., Vol. 77, p. 402, 1899.

PILEUS 1-2.5 cm. broad, convex to subcampanulate, obtuse, at length expanded, innately pilose-scaly, not striate, hygrophanous, *grayish-buff, scales umber-brown to purplish-brown,* fading to pale grayish-white, margin appendiculate at first from the veil. FLESH concolor, rather thin. GILLS adnate-seceding, rounded behind, moderately broad, close, thin, at first whitish, soon drab, then dark purplish-brown, edge white-fimbriate. STEM 2-4 cm. long, 1.5-2 mm. thick, equal, *white, dotted with fuscous, fibrillose scales,* stuffed then hollow, shining when dry, base submycelioid. VEIL membranaceus, white, soon disappearing. SPORES *variously shaped,* subtriangular, inequilateral-elliptical, subangular, etc., sometimes curved, 6-7.5 x 4.5 micr., dark purple-brown. CYSTIDIA clavate to obclavate, or subventricose, stalked, not abundant, 50-40 x 15-18 micr. ODOR none.

On very rotten wood, scattered; in frondose low woods or swamps. Ann Arbor, May-June and September. Infrequent.

Characterized by the peculiarly shaped spores, which are often the shape of corn-kernels, or are elliptical, curved or very irregular. Britzelmayr's species is much larger, the cap measuring 7 cm. across; his spores also are a little larger. It is probably a distinct species.

250. Hypholoma vinosum sp. nov.

PILEUS 5-20 mm. broad, fragile, convex, then companulate, subumbonate, *pulverulent-floccose,* velvety in appearance, *umber-colored,* obscurely tinged with purple, darker in center, dry, even, obscurely rugulose, margin appendiculate at first by pale fragments of the veil. FLESH thin, dingy-white, fragile. GILLS adnate, seceding, crowded, rounded behind, ventricose and rather broad, *bright vinaceous-umber* (Sacc.) finally dark umber, edge entire. STEM 2-4 cm. long, 1-2 mm. thick, equal, except enlarged base, straight, slender, hollow, *vinaceous-umber, color persisting,* pulverulent like pileus, *with a slight purplish juice when broken* in the fresh condition. SPORES minute, 5-6 x 2.5-3 micr., oblong, smooth, obtuse

at ends, purplish-black in mass, pale under microscope. CYSTIDIA none.

On very decayed wood, or logs in mixed woods of hemlock and beech, etc. Bay View, New Richmond. August-September. Infrequent.

This striking little Hypholoma is known by its tinge of dark wine-color mixed with umber, the purplish watery juice of the stem and the minute spores. The trama of the gills and pileus is composed of large, inflated cells, 75-90 x 20 micr., and the surface layer of the pileus of globose cells, several rows thick, up to 30 micr. diameter, tinged smoky vinaceous. When fresh and young it is provided with a thin, evanescent veil, which sometimes forms a slight ring on the stem, and which soon disappears. It has no relationships to such plants as *Lepiota haematosperma* (Fr.) Bres. and *Armillaria haematites* Berk. & Br. which are much stouter plants, have whitish or red-tinged spores, and well developed annulus. It approaches more closely *Psalliota echinata* Fr., but the gills are not free, and the trama is composed of larger cells. The pileus never has pointed scales, and is differently colored. The base of the stem is slightly bulbous.

***Pileus glabrous, rugose, not hygrophanous.*

251. **Hypholoma rugocephalum** Atk. (Probably Edible)

Mushrooms, 1900.

Illustration: Ibid, Pl. 8, Fig. 29, opp. p. 30.

PILEUS 6-10 cm. broad, convex-expanded to plane, the margin at length elevated, broadly umbonate, *strongly radiately rugulose,* moist or subviscid, glabrous, watery brown to tawny, then alutaceus-tan. FLESH thick on disk, thin on margin, tinged yellowish. GILLS adnate, seceding, rounded behind or sinuate, moderately close, rather broad, 5-7 mm., *black-sprinkled,* edge white-fimbriate. STEM 8-12 cm. long, 6-10 mm. thick, equal, subbulbous, even, glabrous, hollow, concolor below, paler above, subannulate by obscure threads of the veil, marked by the blackish stain from the spores. SPORES 9-11 x 6-8 micr., ventricose-elliptical, abruptly pointed at both ends, *minutely tuberculate,* inequilateral, dark purple brown, black in mass. CYSTIDIA on sides of gills cylindrical, enlarged at apex, clustered, hyaline; on edge narrowly flask-shaped. ODOR and TASTE mild.

On the ground, subcaespitose or gregarious, in low or swampy frondose woods. Ann Arbor, South Haven, New Richmond. July-September. Not infrequent.

This species approaches *H. velutinum* in the character of the spore-surface and habit, the cap lacks the fibrillose covering of that species. The shape of the spores is distinctive.

**** Pileus hygrophanous, at the first dotted with superficial flocculent particles or scales, glabrescent.*

252. Hypholoma incertum Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: N. Y. State Mus. Bull. 25, Pl. 58, Fig. 13-20, 1899.
N. Y. State Mus. Mem. 4, Pl. 60, Fig. 1-9, 1900.
Marshall, The Mushroom Book, Pl. 28, opp. p. 80, 1905.
Atkinson, Mushrooms, Pl. 7, Fig. 26 and 27, p. 27, 1900.
Hard, Mushrooms, Pl. 37, Fig. 262, p. 324, 1908.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 1 (as *H. appendiculatum*).
Plate LIV of this Report.

PILEUS 3-7 cm. broad, *fragile,* at first oval, obtuse, then broadly campanulate to expanded, at length split radially, hygrophanous, *pale honey-yellowish,* then buff to white as moisture disappears, white-flocculent or at length glabrous, even or slightly wrinkled when dry, the margin at first hung with loose shreds of the veil, *in age often violaceous, lilac towards margin.* FLESH thin, white. GILLS adnate-seceding, narrow, almost linear, thin, close, *at first white,* then pale dingy lilac or rosy-brown, finally purplish or darker, edge minutely white-fimbriate. STEM 3-8 cm. long, 3-6 mm. thick, rather slender, equal, hollow, subrigid, easily splitting lengthwise, even, *white,* innately silky, flocculose or mealy above. SPORES 7-8 x 4 micr., elliptic-oblong, obtuse, smooth, purple brown in mass. CYSTIDIA none on sides of gills. STERILE CELLS sac-shaped, i. e. inflated above, obtuse, 30-40 x 12-15 micr. BASIDIA 32 x 9 micr., short-clavate. ODOR and TASTE agreeable.

Densely gregarious or subcaespitose, sometimes scattered, among grass on lawns, roadsides, fields or rarely in woods among sticks and debris, nearly always around old stumps or buried remains of stumps, roots or decayed wood; sometimes in greenhouses.

Throughout the State. May to September. (Earliest record May 30.) Very common during rainy seasons in early summer.

This is probably the American form of *H. candolleanum* Fr. The single phrase, "gills at first violaceous," in Fries' description deterred Peck from referring it there. Ricken says "gills at first white, then sordid-rosy or violaceous"; this gives the gill-colors of the European plant without a doubt, and this condition is not much different from that in our plants. As in *H. sublateritium,* the gill-color varies somewhat with the conditions surrounding the development of the plant. Because of the abundance of individuals usually found in a patch, its well-known edibility makes it a plant much sought after. Although the caps are thin, the meat is crisp and of delicate flavor and it often grows at our very doors in the grass over some old hidden remains of a stump. This is also presumably the *H. appendiculatum* of many American authors.

A *variety* occurs in the woods, which only differs in that the plants are mostly *solitary* and long-stemmed, scattered here and there among decayed sticks or leaves; its spores are perhaps slightly longer and slightly variable in shape, but otherwise it is very similar. It may be called var. *sylvestris.*

Illustrations of *H. candolleanum* Fr.
Cooke, Ill., Pl. 546.
Gillet, Champignons de France, No. 352 (as *H. appendiculatum*).
Ricken, Blätterpilze, Pl. 64, Fig. 4.
Patouillard, Tab. Analyt., No. 350.

253. **Hypholoma appendiculatum** Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Ricken, Blätterpilze, Pl. 64, Fig. 5.
Patouillard, Tab. Analyt., No. 349 (faded condition).

"PILEUS 2-4 cm. broad, campanulate-hemispherical, hygrophanous, *dark-honey-brown* (moist) isabelline to ochraceous (dry), with a dull luster, *naked, but at first floccose or fibrillose on the surface or appendiculate from the white veil,* slightly wrinkled and almost atomate when dry. FLESH thin, pallid. GILLS broadly adnate, ascending, crowded, 6-7 mm. *broad,* almost equal in width, *at first and a long time whitish, then grayish-purplish,* at length purple-brown. STEM 5-10 cm. long, 3-6 mm. thick, fragile, narrowed up-

wards, often elongated, mostly curved worm-like, undulate, *white,* silky-shining above, apex mealy and striate, rarely with loose shreds forming a temporary ring. VEIL white, floccose-membranous, at first uniting the margin of the pileus with the stem, *very soon disappearing.* SPORES almost cylindrical-elliptical, 9-11 x 4-5 micr., smooth, red-brown under microscope. CYSTIDIA almost lanceolate, on sides and edge of gills, 40-45 x 10-13 micr."

"Caespitose, in beech woods on leaves and about stumps."

The description is adapted from Ricken's Blätterpilze. This species has been much discussed, and is reported in most American books. The pileus is brown when moist according to most European authors and occurs in the forests where it forms caespitose tufts. I have not been able to distinguish it in the southern part of the state, but have given a description from the most recent work on European Agarics, for the sake of comparison.

254. Hypholoma coronatum Fr.

Hymen. Europ., 1881.

Illustration: Fries, Icones, Pl. 134, Fig. 3.

PILEUS 4-7 cm. broad, *fragile,* at first oval, then convex-campanulate, hygrophanous, obtuse or subumbonate, *umber-brown on disk,* gradually paler toward margin, *whitish-tan or pale alutaceous when dry,* disk often retaining an umber shade and *at length blackish stained in spots,* at first dotted with white, flocculent, superficial scales, *soon denuded,* even or obscurely wrinkled on margin, margin hung by remains of veil in a dentiform manner. FLESH thin, *concolor.* GILLS narrowly adnate, seceding, *very narrow,* crowded, at first dingy-white, soon pale lilaceous-brown, *then umber-colored,* edge minutely white-fimbriate. STEM 5-7 cm. long, rather slender, 3-4 mm. thick, *tapering upward* or subequal, hollow, slightly toughish, *white,* dingy in age, often innately flocculose-scaly then glabrescent and *shining,* even, sometimes subcompressed. SPORES elliptical, 6-7 x 4 micr., smooth, purplish-brown. CYSTIDIA none. STERILE CELLS on edge of gills, broadly cylindrical, obtuse, abruptly short-stipitate, 36 x 10 micr. ODOR and TASTE pleasant.

Gregarious or scattered, attached to leaf-mould, fallen leaves and very rotten wood. Ann Arbor. July-August. Rare.

This differs from the solitary form of *H. incertum,* which also occurs in woods, by the umber color of the entire very young pileus

which has evanescent white-floccose scales sprinkled over it, and in the less roseate hue of the gills in the intermediate stage. It has the size and shape of *H. incertum*. The margin of cap does not become violaceous-tinged in age. Fries says "caespitose" in habit, and to that extent our plant is a variety.

255. Hypholma hydrophilum Fr. (sense of Ricken) (SUSPECTED)

Epicrisis, 1836-38. (Hymen. Europ. as Bolbitius.)

Illustration: Ricken, Blätterpilze, Pl. 64, Fig. 6.

PILEUS 2-6 cm. broad, fragile, campanulate-convex, then expanded, watery *cinnamon-brown to chestnut-brown when moist,* hygrophanous, ochraceous-buff when dry, even or pellucid-substriate on margin, often wavy, *margined with a delicate, superficial, white, silky border* which represents the remains of the veil. FLESH thin, *concolor*. GILLS adnate-seceding, thin, ventricose, not broad, crowded, *at first grayish-brown, then purplish-umber or dark brown,* edge minutely white-fimbriate when young. STEM 4-6 cm. long, 3-6 mm. thick, equal, hollow, splitting, elastic, *glabrous* except the pruinose apex, *shining-white,* undulate, base mycelioid. SPORES 5-6 x 2.5-3 micr., *minute,* smooth, pale purplish-brown under microscope. CYSTIDIA few or none. STERILE CELLS on edge of gills inflated-saccate, short, 30-8 micr. ODOR and TASTE none.

Caespitose in extensive clusters on or near stumps and decayed wood, or at base of living trees. Ann Arbor, New Richmond, (probably throughout the State).

September-November. Not infrequent.

Fries says it distills drops of moisture along the edge of the gills, but this is rare in our climate, although it does occur. It is a very fragile plant, with a white stem and a watery-brown cap which fades quickly in the wind as the moisture escapes. Its minute spores distinguish it, although European authors are not agreed on the spore size. Ricken and Massee give them as above. Saccardo seems to be in error, or there may be two closely allied plants as with us. We have another species, which is almost like it.

256. Hypholoma hydrophilum Fr. (sense of Saccardo)

This differs from the preceding as follows: PILEUS at first sprinkled over its surface with white, floccose particles or minute

scales, even on margin when moist. STEM fibrillose-flocculose, glabrescent. SPORES 7-8 x 4-5 micr., slightly unequally elliptical. CYSTIDIA on sides of gills scattered to somewhat numerous, ventricose-sublanceolate but obtuse, about 50 micr. long. STERILE CELLS pyriform-inflated, numerous on edge of gills.

In large or small tufts about logs, stumps, etc., in swampy woods. June-July. Ann Arbor, Detroit, Bay View. Not infrequent.

This may be *Psilocybe polycephala* (Paul.) (see N. Y. State Mus. Bull. 157, p. 98, Pl. 127, Fig. 1-9, 1912), which it approaches very closely. It is not *Psilocybe spadicea* and does not appear to be closely related to it. It is close to *H. hydrophilum* with which it agrees except in the points mentioned. Cooke's figure (Ill., Pl. 1157) which is doubtfully referred to *H. instratum* Britz. is perhaps the same; at least it is not Britzelmayr's plant which has rounded-triangular spores.

257. Hypholoma saccharinophilum Pk.

N. Y. State Mus. Rep. 25, 1873.

PILEUS 1-3 cm. broad, *fragile*, obtuse, ovate at first, then campanulate to plane, pale watery-brown and *even* when moist, pallid-ochraceous when dry, hygrophanous, *in age assuming a livid-gray or watery-soaked appearance when remoistened,* at first sprinkled with white flecks or flocculent scales, glabrescent and subatomate. FLESH soft, thin. GILLS adnate-seceding, narrow, sublinear or subventricose, close, white at first, slowly becoming pinkish to fuscous-purplish, edge white-fimbriate. STEM 3-7 cm. thick, *fragile,* subequal, undulate, white, silky-fibrillose, pruinose-floccose at apex, hollow, even, subbulbillate at base with radiating mycelium. VEIL delicate, flocculose-fibrillose, white, evanescent. SPORES 6-7 x 3-4.5 micr., elliptical-oblong, smooth, obtuse, purplish-brown in mass, pale under microscope. CYSTIDIA none on sides of gills. STERILE CELLS on edge, large, undulate-cylindrical, abundant, broadly obtuse, 40-50 x 9-11 micr.

Gregarious or scattered, attached to sticks, humus, decaying leaves and wood in low swampy woods of maple, elm, poplar, etc. Ann Arbor. July-August. Frequent.

Although this species was rejected by Peck in his monograph of the New York species (Bull. 150, 1911) it is revived here to supply a name for our species. The cap is characterized by its non-striate margin, and by its peculiar change in color when mature

and when it again becomes moist. On drying the cap finally becomes grayish-white; mature specimens during wet weather assume a livid-gray appearance, which is also the case when kept moist in a box after collecting. It is a rather small, unimportant plant of swamps where it is sometimes plentiful.

Psathyra Fr.

(From the Greek, *psathyros,* friable.)

Purple-brown-spored. Stem *with a cartilaginous cortex,* rigid-fragile, slender and hollow. Gills adnate or adnexed. *Margin of pileus at first straight.* Veil either none or universal, in the latter case leaving delicate flecks or fibrils over the surface of the young pileus and stem. *Pileus hygrophanous.*

Putrescent, terrestrial or on decayed wood. The genus corresponds to Mycena of the white-spored group in that the stem is somewhat cartilaginous and the margin of the pileus is at first straight and appressed to the stem; the pileus is therefore likely to be persistently campanulate as in Mycena. See Plate LVI. The species are slender, fragile and hygrophanous. It is somewhat difficult to tell some of the species from Psilocybe except in the presence of very young stages showing the straight margin of the cap.

The genus naturally falls into two sections, the first composed of species without cortina or universal veil; the second, where the young plants are surrounded by a delicate, usually white, fibrillose or flocculose universal veil. The veil breaks up early and leaves thin superficial flecks or scales on cap and stem, or sometimes merely white fibrils, which are unrecognizable in age or after rains. The species occur rather infrequently, but quite a number have been found in the state. Of these only a part are here presented, as it has been impossible to identify the others with any certainty. Their edibility has not been reported.

Key to the Species

(A) Pileus at first with fibrillose flecks or hairs.
  (a) Densely caespitose; pileus even, slightly pelliculose; stem short. 262. *P. microsperma* Pk.
  (aa) Gregarious; pileus and stem superficially white-hairy at first. 261. *P. semivestita* Berk.
(AA) Pileus glabrous; stem polished.
  (a) Caespitose on or near wood; pileus striatulate when moist; stem long. 259. *P. umbonata* Pk.

(aa) Not densely caespitose; solitary or gregarious.
(b) Spores 7-9 micr. long; pileus umber. 259. *P. obtusata* Fr.
(bb) Spores 10-12 micr. long; pileus rufous-brown. 260. *P. persimplex* Britz.

Section I. Conopilae. (Incl. of Obtusatae Fr.) Surface of pileus glabrous; stem polished and shining.

258. Psathyra umbonata Pk.

N. Y. State Mus. Rep. 50, 1897.

Illustrations: Plates LV, LVI of this Report.

PILEUS 2-5 cm. broad at maturity, 2-3 cm. high, subcylindrical at the very first, then conico-campanulate, at length strongly and obtusely umbonate, hygrophanous, *dark bay-brown to purplish-brown and striatulate* (moist), grayish-white, even and atomate (dry), sometimes faintly rugulose when dry. FLESH thin, concolor. GILLS ascending, *adnate-seceding,* rather broad, 3-4 mm., narrowed in front, close, becoming dark purplish-brown, finally almost black, edge white-fimbriate. STEM 5-10 cm. long, 2-3 mm. thick, slender, flexuous, rigid-fragile, *equal,* hollow, sometimes twisted, *shining-white* becoming pallid. SPORES 13-15.5 x 7-8 micr., elliptical, obtuse, smooth, dark purplish under the microscope, black in mass. CYSTIDIA none on sides of gills; sterile cells on edge, cystidia-like, ventricose, apex obtuse. BASIDIA 4-spored, narrowly stalked, inflated above.

Caespitose or gregarious-subcaespitose, on decayed wood, usually stumps and logs. June-September. Ann Arbor, New Richmond. Not infrequent.

Forming large clusters of many individuals, often at the end of old moist logs. Its long slender stems and cone-shaped caps distinguish it at once from Hypholoma clusters. Sometimes only a few individuals occur in one place. It has the stature and general appearance of *P. conopilea* Fr., as shown in the published figures, but differs in the truly adnate gills and the striate margin of the moist cap. Peck compares it with *P. corrugis* Fr. (B) Another species sometimes occurs, which differs from the preceding mainly in the size of its spores: 15-18 x 7-8 micr. This differs from *P. elata* Mass., in the margin being long-striate. The size, shape and colors are the same as in *P. umbonata.* Because of its almost black spores it might be mistaken for *Psathyrella subatrata,* but that species does not grow on wood.

259. Psathyra obtusata Fr.

Syst. Myc., 1821.

PILEUS 1-3 cm. broad, campanulate-convex, *obtuse,* hygrophanous, *umber* and faintly or not at all striate *when moist,* pale ochraceous to buff and atomate when dry, glabrous; veil none. FLESH thin. GILLS ascending, adnate, *rather broad,* close to subdistant, umber when mature, edge white-fimbriate. Stem 5-8 cm. long, 1-3 mm. thick, equal, glabrous, hollow, white then pallid, rigid-fragile, flexuous, curved at base. SPORES elliptical, 7-9 x 4-4.5 micr., smooth, dark purplish-brown.

Solitary or subcaespitose, on very rotten wood. September. New Richmond, Bay View. Infrequent.

Distinguished from the preceding by the obtusely convex pileus, more scattered habit and shorter stems. Form *minor:* This varies smaller, with a pileus .5-1 cm. broad and rather slender stem. The spores, etc., are the same. Cook's figure (Ill., Pl. 593) does not represent our plants.

260. Psathyra persimplex Britz.

Bot. Centralbl., Vol. 77, p. 436, 1899.

PILEUS 1-2.5 cm. broad, campanulate at first then campanulate-convex, obtuse, *margin soon spreading,* hygrophanous, rufous-brown to fuscous brown and striatulate when moist, whitish-buff to pale ochraceous when dry, atomate, *glabrous.* Veil none. FLESH very thin. GILLS ascending-adnate, rather broad, ventricose, close to subdistant, whitish then gray to grayish-umber, edge white-fimbriate. STEM 4-10 cm. long, *slender,* 1-2 mm. thick, equal, *whitish or pallid,* somewhat fragile, stuffed by white pith then hollow, glabrous, shining, flexuous, pruinate at apex, rooting at base and attached to wood by hairs. SPORES elliptical, 10-12 x 5-6.5 micr., obtuse, smooth, dark purple-brown under the microscope. CYSTIDIA scattered or few on sides of gills, up to 70 x 15 micr., sometimes bifurcate at apex, ventricose-lanceolate; smaller on edge, 30-45 x 6-12 micr., obtuse. BASIDIA 30 x 10-12 micr., 4-spored. ODOR none.

Gregarious on sticks and decayed wood in hemlock woods. New Richmond. September. Rare.

This seems to be a segregate from *P. obtusata,* from which it

differs in the size of its spores and the characteristic spreading of the margin of the pileus.

Section II. Fibrillosae. Stem and pileus when young flocculose or fibrillose from the universal veil.

261. Psathyra semivestita Berk. and Br.

Ann. Nat. Hist., p. 920, 1836.

Illustrations: Cooke, Ill., Pl. 578.
Ricken, Die Blätterpilze, Pl. 67, Fig. 4.

PILEUS 1-2 cm. broad, ovate-campanulate, subobtuse, hygrophanous, rufous-umber and pellucid-short-striate when moist, pale isabelline when dry, *surface sprinkled when young by superficial, white fibrillose flecks.* FLESH very thin, soon ochraceous-tinged. GILLS broadly adnate, *narrowed in front,* sometimes almost subtriangular, close, dark smoky-fuscous, edge at times white-fimbriate. STEM 4-6 cm. long, 1.5-2 mm. thick, *equal,* hollow, even, rigid-fragile, pale fuscous, pallescent, *closely sprinkled over with white, fibrillose flecks.* SPORES elliptical, 9-12 x 5-6 micr., variable in size, smooth, dark purple-brown. CYSTIDIA few on sides of gills, numerous on edge, ventricose-sublanceolate, obtuse, 50-60 x 12-15 micr. BASIDIA short and stout, 24 x 9-10 micr. ODOR none.

Gregarious, on horse-dung. New Richmond. September.

Known by the rufous tinge to the color of the pileus and the white fibrils which at the very first cover the cap and stem. *P. vestita* Pk. *is very similar,* if not the same, but the spore-sizes are given somewhat smaller; see description in N. Y. State Mus. Bull. 105, p. 28.

262. Psathyra microsperma Pk.

Torr. Bot. Club, Bull. 26, 1899.

PILEUS 1-2.5 cm. broad, at first ovate or subhemispherical, then convex-campanulate, often irregular, obtuse, *even,* hygrophanous, *slightly pelliculose,* pale watery-brown (moist) cinereous-buff (dry), at first with scattered flocculose white scales, *glabrescent,* margin at first straight. FLESH thin, concolor. GILLS adnate-seceding, close, *not broad,* subventricose, narrowed toward front, at first whitish then grayish-brown tinged purplish, edge white-fimbriate.

STEM 2-4 cm. long, 2-3 mm. thick, equal, rigid-fragile, hollow, *pure white,* apex subpruinose, subfibrillose, *at first covered by minute, white fibrils from the universal veil.* SPORES elliptical, 6-8 x 4-4.5 micr., smooth, purplish-brown.

Very caespitose, on grass or about stumps in or near woods. Ann Arbor. October. Rare.

This species was described by Peck from material sent from Ohio; he does not report it from New York State. The pileus is provided with a slight pellicle which is scarcely gelatinous. The stem separates rather easily from the pileus when the gills have receded from it. Our specimens grew out of the turf with no sign of nearby wood. They were sent to Peck who identified them as his species. It is easily mistaken for a Psilocybe, but the margin of the young cap is straight at first.

Psilocybe Fr.

(From the Greek, *psilos,* naked, and *kybe,* head, referring to the lack of veil-remnants on the pileus.)

Purple-brown-spored. Stem with a *cartilaginous cortex,* rigid-fragile or toughish. Gills adnexed to adnate-subdecurrent. *Veil scarcely noticeable or entirely lacking,* neither forming an annulus nor appendiculate on the margin of the pileus. *Margin of pileus at first incurved.*

Putrescent, terrestrial, on very decayed wood or around stumps, buried roots, sticks, etc. The genus corresponds to Collybia of the white-spored group in that the stem has a cartilaginous cortex and the margin of the pileus is at first incurved. The species are usually rather thin and fragile and not large. They are distinguished from the Hypholomas by the scanty or absent veil; those species which possess a veil often show no signs of it in windy or dry weather.

The PILEUS is convex or campanulate and expands in many cases until quite plane. The color is usually dull, even in those with reddish, yellow or olive hues. It is usually glabrous; a few species, however, like *P. canofacious,* have a somewhat fibrillose surface. The GILLS are broadly adnate and mostly slightly decurrent or triangular in the first section; in the other sections they are rounded behind or adnexed-emarginate. In age they are often sprinkled in a variegated manner by the spores. The STEM is neither stout nor truly fleshy. It is often white when young, but varies to brownish, reddish or grayish.

The genus is divided here into three sections, separated fundamentally by the broad, subdecurrent gills of the first group, the pellicle of the pileus in the second group, and the hygrophanous flesh of the plants in the third group. Few species have any record for or against their edibility; *P. foeniseeii*, however, is known to be edible.

Key to the Species

(A) Pileus hygrophanous.
(a) Spores in mass brick-reddish. 277. *P. conissans* Pk.
(aa) Spores not red in mass.
(b) Large; pileus 5-12 cm. broad, brown when moist. 270. *P. larga* sp. nov.
(bb) Smaller; pileus 4 cm. or less in width.
(c) Spores large, 13-18 micr. long; common on lawns and grassy places. 276. *P. foenisecii* Fr.
(cc) Spores less than 13 micr. long.
(d) Pileus subviscid and rufous-brown when moist; gills very broadly adnate.
(e) Growing on dung or pastured fields. 264. *P. subviscida* Pk.
(ee) Growing on the ground in woods. 265. *P. atrorufa* Fr.
(dd) Pileus not subviscid; gills not subdecurrent.
(e) Stem pale fuscous, 10-15 cm. long; on sphagnum. 267. *P. atrobrunnea* Fr.
(ee) Stem white, shorter.
(f) Spores small, 6-7 micr. long.
(g) Pileus 1-4 cm. broad, livid-brown when moist and striate. 271. *P. cernua* Fr.
(gg) Pileus less than 1 cm. broad, dull-brownish when moist, spotted. 275. *P. submaculata* Atk.
(ff) Spores 8-10 micr. long or longer, pileus dark-brown when moist.
(g) Stem falsely bulbous from adhering sand, often subcaespitose and clavate. 273. *P. arenulina* Pk; *P. ammophila* Mont.
(gg) Stem not markedly enlarged by adhering sand, equal.
(h) Gills narrow; spores 10-12 x 6 micr.; stem slender, 1-2 mm. thick. 272. *P. murcida* Fr.
(hh) Gills medium broad; spores 7-9 x 4-5 micr.; stem 3-4 mm. thick, shorter. 274. *P. agrariella* Atk.
(AA) Pileus not hygrophanous.
(a) Pileus with white fibrils or hairy scales on the surface; umber-colored. 268. *P. canofaciens* Cke.
(aa) Pileus glabrous except margin, viscid or subviscid.
(b) Stem long, 7-10 cm., pileus grayish-olive; on sphagnum or dung. 268. *P. uda* Fr.
(bb) Stem shorter; pileus without olive tints.
(c) On dung; pileus livid-brownish-yellow; gills broadly adnate; spores very large. 263. *P. merdaria* Fr.
(cc) On the ground in woods; pileus tawny-fulvous; gills emarginate-adnate. 219. *P. ericaea* Fr.

Section I. Deconicae. Gills broad and broadly adnate, sometimes decurrent by a tooth; margin of pileus at first with a flocculose or fibrillose, delicate and very evanescent veil.

This section approaches Stropharia; it was raised to generic rank by W. G. Smith under the name Deconica. The veil, although usually very evanescent, may at times leave a slight annular mark on the stem so as to simulate Stropharia, and hence the species must be carefully compared with species of that genus.

263. Psilocybe merdaria Fr.

Syst. Myc., 1821 (as Stropharia in Hym. Europ.).

Illustrations: Fries, Icones, Pl. 130, Fig. 3 (as Stropharia).
Cooke, Ill., Pl. 537 (?) (as Stropharia).
Gillet, Champignons de France, No. 649 (as Stropharia).
Ricken, Blätterpilze, Pl. 66, Fig. 1.

PILEUS 1-3 cm. broad, campanulate-hemispherical, finally plane, *livid-brownish to livid-yellow,* obtusely subumbonate, slightly darker on umbo, glabrous, *even, subviscid,* at first with slight flecks on the margin. FLESH pallid, thin. GILLS broadly adnate to triangular-subdecurrent, *broad, subdistant, yellowish at first,* then powdered by purple-brown spores, at length dark brown. STEM 2-4 cm. long, 1-3 mm. thick, equal, even or slightly ridged at apex by decurrent gills, delicately flocculose-fibrillose, glabrescent, *pale yellowish,* stuffed then hollow, often with slight annular remnants or fibrils. SPORES *large,* 14-17 x 7-8 micr., elliptical, smooth, purplish-brown under the microscope. CYSTIDIA none. ODOR mild.

On horse dung along with *Stropharia stercoraria.* Ann Arbor. May-June. Infrequent.

Not to be confused with *Naucoria semiorbicularis, N. pediades* and *N. platysperma,* the spores of which are smaller and lack the purple tinge. It is said to differ from *P. coprinophila* by the grayish young gills of the latter. I have followed Karsten and Britzelmayr (quoted by Sacc.) in referring this plant with large spores under *P. merdaria.* Other authors differ widely and it is clear that several species are either confused or that the plant needs segregation. Cooke, in the Illustrations, gives the size 8 x 5 micr.; W. G. Smith, 9 x 6 micr.; Ricken, 12-13 x 7-9 micr. Ricken says "the purplish color of the spores disappears in dried specimens," hence the study of exsicatti is of little value.

264. Psilocybe subviscida Pk.

N. Y. State Mus. Rep. 41, 1888 (as Deconica).

PILEUS 5-15 mm. broad, fragile, ovate-campanulate then subexpanded and obtusely umbonate, hygrophanous, at first viscid and *chestnut-brown or rufous-brown and striatulate when moist,* very soon buff with or without an ochraceous umbo when dry, glabrous, *subviscid.* FLESH thin. GILLS broadly adnate, subtriangular, thickish, *subdistant, broad,* at first whitish, then umber. STEM 2-4 cm. long, 1-2 mm. thick, slender, equal or tapering downwards, pallid to fuscescent, varying to chestnut brown within and without, *at first covered with delicate white fibrils.* SPORES oval or ovate, 6-7 x 4-5 micr., smooth, pale brown tinged with wine-color under microscope. VEIL slight, fugacious.

In pastured fields among grass, on dung, and on moss in woods. April-June. Ann Arbor. Infrequent.

This approaches *P. physaloides* Fr. (sense of Ricken) in color, but the gills are not crowded and the spores are smaller. It also differs from *P. bullacea* Fr. in the subdistant gills. The latter species is doubtless native here, but the discrepancies in the descriptions by the different authors make it difficult to place. Saccardo following Fries, says cap of *P. bullacea* is fulvous-bay-color when moist, and gives the spores 6-10 x 4-7 micr.; Ricken describes the cap as chocolate-brown when moist, with spores like our *P. subviscida.* Which of these, if any, is *P. bullacea* is therefore hard to tell; nevertheless it is desirable to follow the description of Fries. The chestnut or rufous-brown color, and the visicidity quickly disappear and the pileus is then tan-colored and even.

265. Psilocybe atrorufa Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 571.

PILEUS 5-12 mm. broad, convex-hemispherical, obtuse, hygrophanous, *umber-brown then rufous-brown and striatulate when moist,* glabrous and pale alutaceus when dry, *not viscid,* margin faintly veiled. FLESH thin, concolor, broadly adnate or subdecurrent, subtriangular, close, at length umber-colored. STEM 3-4 cm. long, 1-2 mm. thick, slender, hollow, equal or tapering downward, obscurely flocculose-fibrillose, glabrescent, *rufous-bay color through-*

out. SPORES 5-8 x 4-5.5 micr., oval, somewhat pointed at ends, smooth, reddish-brown under microscope. CYSTIDIA none. STERILE CELLS on edge of gills, slender, lanceolate-subulate, 30-34 x 5 micr.

Gregarious, on the ground in woods. Ann Arbor, Bay View. (Probably throughout the State). June-July.

Differing from the preceding in the non-viscid pileus and closer gills. Here again two very different spore-sizes have been given, and although Cooke's figure is somewhat illustrative of our plant, his spores are too large, 10-12 x 6 micr.

Section II. Tenaces. Pileus with a pellicle, moist or subviscid when young; veil slight, cortinate. *Toughish and somewhat brightly colored.*

266. Psilocybe canofaciens Cke.

Grevillea, Vol. 14, p. 1, 1885.

Illustration: Cooke, Ill., Pl. 621.

PILEUS 1-3 cm. broad, campanulate-convex, then expanded, obtuse or subumbonate, even, *umber-brown, covered at first by delicate,* white, scattered fibrils, at length somewhat appressed fibrillose-scaly and fibrils concolor. FLESH thickish on disk, concolor. GILLS adnate, rather broad, *ventricose,* subdistant, *dark umber.* STEM 5-7 cm. long, 2-4 mm. thick, equal or slightly tapering, stuffed then hollow, *dark umber-color,* darker at base, covered with long fibrils which become matted, toughish. SPORES elliptical-oblong, slightly curved in one plane, *very variable in size,* 10-15 micr. long (rarely much longer), 4-5 micr. thick, purple-brown under microscope, umber in mass.

On the ground in woods. Negaunee. August. Rare.

Sent to me by Miss Rose M. Taylor. It is a very characteristic plant, with its dark colors, the fibrillose-hairy covering on the cap and stem and the variable spore-size. This plant is a striking commentary on the value of spore-characters in identification. Massee (British Fungus Flora) states that the spores vary very much in size in the English specimens, and in Michigan this peculiarity is also found.

267. Psilocybe atrobrunnea Fr.

Epicrisis, 1836-38.

Illustration: Plate LVI of this Report.

PILEUS 1-4 cm. broad, *campanulate-convex,* obtusely umbonate, hygrophanous, *umber when moist,* fading to dingy ochraceous, even, glabrous. FLESH thin, concolor. GILLS adnate but rounded behind, not uncinate, *seceding,* rather broad, *subdistant,* brownish-gray, then smoky-fuscous, edge whitish. STEM 5-15 cm. long, *elongated,* 1.5-4 mm. thick, slender, flexuous, equal or subattenuate at base, even, *pale fuscous, covered with white silky fibrils,* stuffed, concolor within, cartilaginous, toughish. SPORES elliptical, 10-12 x 5-6 micr., smooth, dark purplish-brown. ODOR and TASTE slight, somewhat farinaceous.

In tamarack bogs, among sphagnum. September-November. Ann Arbor. Local.

Known by its sphagnum habitat, dark color when moist and its long stems. The superficial white fibrils on the stem seem to indicate a veil.

268. Psilocybe uda (Fr.) Battaille

Syst. Myc., 1821, Bull. de la. Soc. Myc. de France, Vol. 27, p. 374, 1911.

PILEUS 1-2 cm. broad, *campanulate,* mammilate, with a viscid pellicle, *striatulate and grayish-olive with rufous-brown umbo* when moist, shining, fading to creamy white with pale-yellow umbo, glabrous. FLESH thin. GILLS adnate or slightly subdecurrent, very broad, close to subdistant, *gray* then violaceous-blackish, edge white-flocculose. STEM 7-10 cm. long, *slender,* 1.5-2 mm. thick, slightly thicker toward base, equal elsewhere, pallid-whitish, rigid, glabrous, even, hollow, sometimes *annulate* by the delicate, superior, fibrillose remains of the veil. SPORES elliptical, 17-20 x 9-10 micr., smooth, *bright violet-purple under the microscope,* purplish-blackish in mass. STERILE CELLS on edge of gills, narrow, linear. ODOR *none.*

On horse-dung, in low woods. New Richmond. September.

This species is slender-stemmed like *Stropharia umbonatescens,* and its spores are about the same size. It differs from *S. umbonatescens* in the olive-colored, striate pileus, and lack of odor.

This is referred to by Fries as var. *elongata* (Hymen. Europ.). The varietal name is used by Ricken for a plant which he calls *Hypholoma elongatum,* which has much smaller spores, while he claims that *P. uda* has no trace of a veil, but has the large spores. Battaille (l. c.) describes our plant well and emphasizes the deep violet color of the spores, which is quite marked in the Michigan specimens, as well as the slight evanescent annulus. The only discrepancy is that the habitat of *P. uda* is on dung instead of sphagnum and while this is important it is deemed best to refer it for the present to the above species. It is a better Stropharia.

269. Psilocybe ericæa Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 136, Fig. 1.
Cooke, Ill., Pl. 568.

PILEUS 2-3 cm. broad, convex then subexpanded, obtuse or umbonate, *even, subviscid,* with a gelatinous separable pellicle, *tawny-fulvous,* glabrous, at first with a whitish, fibrillose cortina on edge. FLESH firm, thickish, rather compact, pallid. GILLS adnate, becoming emarginate, *broad,* close or almost crowded, whitish at first, then fulvous-brown and sprinkled with blackish spots, edge minutely white-fimbriate. STEM 5-8 cm. long, 3-4 mm. thick, equal, flexuous, *stuffed with a rather persistent pith,* glabrous, apex pruinose, pallid then fuscescent, curved at base and attached to fallen leaves, etc. SPORES oval-elliptical, inequilateral, 9-11 x 5-5.5 micr., pale purplish under the microscope, dark in mass. CYSTIDIA none. STERILE CELLS on edge of gills, subcylindrical, elongate-narrow, 3-4 micr. diam. ODOR and TASTE mild.

On the ground in mixed woods. New Richmond. September.

Agrees well in size, shape and color with the figures of Fries. Authors give conflicting spore-sizes and it seems impossible to be certain of the plant on this point.

Section III. Rigidae. Cortinate veil none or slight (except in *P. larga*), pileus *hygrophanous,* rigid-fragile when dry, scarcely or not at all pelliculose.

This section has the appearance of the second section of the Hypholomas except in the absence of or reduced development of the veil; the first species represents a connecting link between them.

270. Psilocybe larga sp. nov.

Illustration: Plate LVII of this Report.

PILEUS *large,* 4-14 cm. broad, oval-campanulate at first, at length expanded-plane and radially cracked or split on the margin, *fragile, hygrophanous, bay-brown* to ochraceous-brown and even *when moist, whitish-tan* and radiately rugulose *when dry, at first dotted with scattered, small, snow-white, floccose, superficial scales,* quickly denuded, often only with white-silky margin. FLESH rather thin, white when dry, scissile, homogeneous, with large cells. Gills adnate, rounded behind, *rather broad,* close to subdistant, white at first, then pale fuscous, *finally umber,* edge minutely white-fimbriate. STEM *stout,* 5-10 cm. long, 5-15 mm. thick, equal or tapering upward, soon *hollow,* terete or compressed, rather firm, *usually striate to sulcate,* furfuraceous but glabrescent, then shining, *white,* cortex subcartilaginous. SPORES elliptical, 8-9.5 x 4-5 micr., smooth, obtuse, *purple-brown under microscope,* umber in mass. CYSTIDIA abundant on sides and edge of gills, 70-80 x 12-15 micr., subventricose to subcylindrical, narrow-stalked, obtusely rounded above. BASIDIA 4-spored. ODOR and TASTE none.

Gregarious or caespitose around old stumps, buried roots, etc., in grassy clearings or woods. Ann Arbor. May-September. (More frequent in spring.) Not infrequent in elm swamps or clearings.

A large and striking species, related to *P. spadicea* and *Hypholoma sarcocephalum.* From the former it differs markedly in the presence of a veil, the adnate gills and the striate stem; from the latter, in its strongly marked hygrophanous character, and lack of any pellicle. Ricken suggests that these two species are identical. I suspect that all three are variations of the same plant, but at present this cannot be established. Our plant is often found without a sign of the floccose remnants of the veil, especially after a rain or in windy weather. Under favorable weather conditions, however, the developing plant shows the veil well. *Psilocybe spadicea* seems to be differently understood by authors. According to Quelet, Ricken and others it is a large plant, like *P. larga.* If this is true, Cooke's figures are very misleading, and as the English authors have followed his idea, it is not surprising to have it reported by Peck and others for this country in a way to suggest *Hypholoma hydrophilum,* which is a much smaller and more densely caespitose plant. I have not seen *P. spadicea* Fr. in the sense of Ricken and Quelet.

271. Psilocybe cernua Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 574.
Plate LVIII of this Report.

PILEUS 1-4 cm. broad, convex-campanulate, hygrophanous, *livid watery-brown when moist and then striate,* whitish when dry, often areolate cracked and rugulose in age, *veil entirely lacking.* FLESH rather thin, whitish when dry. GILLS adnate-seceding, moderately broad, rounded behind, close, at first whitish, finally purplish-umber, edge minutely white-flocculose. STEM 2-5 cm. long, 2-4 mm. thick, equal or tapering below, delicately stuffed then tubular, *white, rigid-cartilaginous* when dry, subfibrillose, apex pruinose, flexuous or variously curved. SPORES oblong-elliptical, 6-7 x 3-4 micr., smooth, purple-brown under microscope. CYSTIDIA none. STERILE CELLS on edge of gills, short, subsaccate, 25 x 7 micr. ODOR and TASTE none.

Caespitose or subcaespitose-gregarious, at the base of trees.

Ann Arbor, New Richmond. September-October. Infrequent.

The pileus is rather firm when dry, not splitting easily on the margin on drying. This species agrees well with the descriptions and Cooke's illustration.

272. Psilocybe murcida Fr.

Syst. Myc., 1821.

PILEUS 2-4 cm. broad, obtuse, *fragile,* campanulate-convex, then expanded, hygrophanous, *dark bay-brown and striatulate on margin when moist,* fulvous-alutaceous or rufous-tinged when dry, then subrugulose and atomate, glabrous. FLESH thin, subrigid and fragile. GILLS adnate, almost close, *narrow,* attenuate in front, subventricose, becoming fuscous-purplish, edge white-flocculose. STEM 6-8 cm. long, 1.5-2.5 mm. thick, *slender, fragile, white at first,* then pallid, slightly fibrillose, glabrescent, stuffed with a white pith then hollow, undulate. VEIL none. SPORES elliptical-oblong, 10-12x6 micr., obtuse, smooth, purple-brown under microscope, purplish-black in mass. CYSTIDIA scattered, on sides and edge of gills, ventricose-elongated, narrow above, 50-60 x 9 micr. ODOR and TASTE none.

Solitary and scattered. On low, wet ground in low woods. Ann

Arbor, New Richmond. May, June and September. Not infrequent in wet weather.

Agrees well with the Friesian description. The gills are perhaps not truly subdistant but rather close. The color of the cap changes from umber to rufous then pale tan. The slender, white, equal stem is a marked character. When moist, the cap is somewhat shining, with a gelatinous appearance, but there is no pellicle and the trama is homogeneous.

273. Psilocybe arenulina Pk.

N. Y. State Mus. Rep. 30, 1878.

PILEUS 1-3 cm. broad, convex then plane, glabrous, hygrophanous, *dark brown and coarsely striate on margin when moist,* dingy white when dry, margin at first incurved and fibrillose-flocculose. FLESH thin, concolor. GILLS adnate, close, not broad, ventricose, becoming brownish then purple-brown and dotted by spore-masses. STEM 3-5 cm. long, 1.5-2 mm. thick, tapering upward, hollow, *whitish,* the lower half covered with adhering sand and sometimes clavate. SPORES 10-11 x 5 micr., elliptical, smooth, purple-brown under the microscope. CYSTIDIA none.

Gregarious or subcaespitose, on sandy soil. Port Huron, New Richmond. September-October.

This seems to be close to *P. ammophila* Mont. (see illustration in Hard's Mushrooms, Fig. 268, p. 330, 1908). The spores of that species appear to be too large, and the habit is different. At least our plants were not like those figured by Hard.

274. Psilocybe agrariella Atk.

Ann. Myc., Vol. VII, p. 374, 1909.

PILEUS 1-3.5 cm. broad, campanulate-convex, obtuse, then expanded, *fragile,* hygrophanous, *obscurely rivulose or striatulate and umber-brownish to pale rufous when moist,* glabrous, pallid ochraceous or whitish when dry, margin at first incurved and delicately white-silky from the evanescent veil. FLESH thin, nearly homogeneous, of floccose cells, concolor. GILLS adnate, seceding, moderately broad, ventricose, *close,* at length purplish umber, edge white-fimbriate. STEM 4-6 cm. long, 3-4 mm. thick, equal, *fragile, white,* even, apex pruinose, glabrous, stuffed soon hollow, base

white-mycelioid. SPORES elliptical, 7-9 x 4-5 micr., inequilateral, smooth, dark purple-brown under the microscope, blackish-purple in mass. CYSTIDIA scattered on sides of gills, more numerous on edge, 45-55 x 10-15 micr., ventricose-lanceolate, apex obtuse. ODOR and TASTE mild.

Gregarious or scattered, on the ground or leaf mould, in wet places of low frondose woods. Ann Arbor, New Richmond. May, June and September. Infrequent.

The color is somewhat variable in different localities but the other characters are the same. It differs from *P. cernua* in the presence of a very slight veil when young. The pileus is slightly rigid but fragile; its surface has a slight gelatinous feel when wet, but there is no distinct pellicle, merely a somewhat differentiated upper layer of more turgid cells.

A closely related species occurs in low wet ground in woods, which differs from this mainly in possessing a thin subgelatinous pellicle of horizontal narrow hyphae, with narrower gills and pellucid-white stem. The color of cap and stem and the microscopic characters are otherwise the same. Perhaps it is a variety of *P. ericaea* Fr., but the pileus is distinctly hygrophanous.

275. Psilocybe submaculata Atk.

Ann. Myc., Vol. VII, p. 375, 1909.

"PILEUS 4-10 mm. broad, convex, glabrous, hygrophanous, *dull brownish,* then dull white with dark watery and yellowish spots, margin at first incurved. FLESH with a surface layer of subpyriform to subglobose angular cells, inner portion floccose and grading into the surface cells. GILLS adnate, emarginate, *rather crowded,* brownish with a purple tinge, edge whitish. STEM 2-3 cm. long, 2-3 mm. thick, fistulose, even, somewhat flexuous, *white and shining,* apex white-mealy, base with white mycelium. SPORES suboblong, subelliptical, slightly inequilateral, 6-7 x 3-4 micr., purple-brown under the microscope. BASIDIA 4-spored. CYSTIDIA few on sides of gills, very numerous on edge, ventricose, apex crystalline. On very rotten wood."

The description is adapted from that of Atkinson, who reported specimens from Michigan. I have not studied it.

276. Psilocybe foenisecii Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 590.
Gillet, Champignons de France, No. 592.
Ricken, Die Blätterpilze, Pl. 66, Fig. 8.
Swanton, Fungi, Pl. 9, Fig. 1.
Murrill, Mycologia, Vol. 3, Pl. 40, Fig. 5.
Hard, Mushrooms, Fig. 267, p. 329, 1908.
Plate LIV of this Report.

PILEUS 1-2.5 cm. broad, rarely broader, campanulate-convex or subhemispherical, obtuse, seldom plane, hygrophanous, *dark grayish-brown to smoky-fuscous and even when moist*, sometimes rufescent, subzonate on drying, drab-tan-color to buff when dry, glabrous, veil entirely lacking. FLESH thin, dingy-pallid. GILLS adnate, almost subdistant, *broad,* ventricose, sometimes sinuate-emarginate, purplish-fuscous or fuscous-brown, *variegated,* edge white-fimbriate. STEM *slender,* 4-8 cm. long, 1.5-2 mm. thick, equal, rigid-elastic, fragile, hollow, even, glabrous, pruinose at apex, pallid to subrufescent, not rooting. SPORES *variable in size,* 13-18 x 8-10 micr., broadly elliptical, or in another plane broader at one end, *slightly tuberculate,* apiculate, purplish-brown under the microscope. CYSTIDIA none. STERILE CELLS on edge, narrow, 30-36 x 3-5 micr. ODOR and TASTE none.

Gregarious or scattered, among grass on lawns, roadsides, grassy places in woods, meadows and pastures. Throughout the State. May-June (less often, July-September). Very common.

The "haymarker's Psilocybe" is to be looked for during the warm spring months on our lawns everywhere. Its colors are dull and quite variable, but because of its abundance it can soon be recognized under its many guises. A zonate effect is often seen on the pileus as the moisture dries out. It is edible. The spore-sizes are given incorrectly by several authors, but this is not surprising because of their great variability, even in the same plant. The rough character of the surface of the spore distinguishes it from the others.

277. Psilocybe conissans Pk.

N. Y. State Mus. Rep. 41, 1888 (as Clitopilus).

PILEUS 2.5-5 cm. broad, broadly convex becoming plane, hygrophanous, *watery-brown to pale chestnut when moist,* pale alutaceous to buff when dry, striatulate then subrugulose, glabrous or subpruinose, veil lacking. FLESH thin, whitish. GILLS adnexed, rounded behind, thin, close, brownish *then dusted by the reddish-cinnamon or vinaceous-red spores.* STEM 2.5.5 cm. long, 2-4 mm. thick, *equal,* rather slender, rigid-fragile, hollow, *white,* curved or flexuous, glabrous, pruinose at apex. SPORES elliptical or almost oblong, 7-9 x 4-5 micr. (rarely longer), smooth, hyaline but with reddish tinge under the microscope, brick-red in mass.

Caespitose around base of stumps in hemlock-maple woods. Marquette and Houghton. August-September. Rather rare.

A peculiar plant, whose spores might well lead one to look for it under the pink-spored group but whose general appearance is that of a Psilocybe. Under the microscope the spores are almost hyaline-white but the exospore is slightly tinged with reddish; when dusted on the cap and stem, as is often the case, they have a brick-red to vinaceous color. Peck originally referred it to Clitopilus, but in the N. Y. State Bull. 122, he changed it to Psilocybe.

OCHRASPORAE

Paxillus Fr.

(From the Latin *Paxillus,* a small stake.)

Ochre-spored. Stem confluent with the pileus, fleshy, tending to be eccentric or lacking. Gills mostly decurrent, forked behind and *anastomosing on the stem, easily separable from the trama of the pileus.*

Fleshy, putrescent, distinct fungi, growing on the ground, forest debris or decayed wood. When present the stems are stout and usually slightly eccentric, sometimes central; in two species the pileus is sessile and lateral, and the stem is lacking. The genus Paxillus is here limited to include only the plants placed by Fries under the tribe Tapinia. The white-spored species have been referred to Clitocybe under the section Paxilloideae. *P. lepista* Fr., which is said to have reddish spores is not known to me. Ricken

has placed some of the species of Clitopilus with reddish spores next to *Paxillus lepista,* an arrangement which hardly solves the problem. Several species of Clitocybe and Tricholoma with a tint of reddish in the spore-print and with gills separable from the pileus are equally close to *P. lepista* as it is described, and an arrangement of these species under a single genus is desirable: such are *Tricholoma panaeolum* var. *caespitosum* and *Tricholoma nudum.* Karsten, Earle and others have raised the tribe Tapinia to the rank of a genus and include under it the species described below. No uniformity of agreement has so far resulted and I prefer to retain the name Paxillus in this report because of its established use for our plants and therefore its practical convenience.

Key to the Species

(a) Stem present; pileus medium large.
  (b) Stem covered by blackish-brown, dense, tomentose hairs. 280. *P. atrotomentosus* Fr.
  (bb) Stem not tomentose-hairy.
    (c) Gills golden-yellow; pileus reddish-yellow-brown. 278. *P. rhodoxanthus* Schw.
    (cc) Gills dingy olivaceous-yellowish, becoming brown when bruised. 279. *P. involutus* Fr.
(aa) Stem lacking; pileus lateral.
  (b) Gills orange-yellow, corrugate. 281. *P. corrugatus* Atk.
  (bb) Gills pale yellowish or yellowish tan; sinuous-crisped. 282. *P. panuoides* Fr.

278. Paxillus rhodoxanthus Schw.

Synopsis Fung., 1822.

Illustrations: Cooke, Ill., Pl. 834 (as *P. paradoxus*).
Bresadola, Fung. Trid., Pl. 207 (as *Phylloporus rhodoxanthus*).
Fries, Icones, Pl. 115, Fig. 2 (*as Flammula tammii*).
Gillet, Champignons de France, No. 136 (as *Clitocybe pelletieri*).
Patouillard, Tab. Analyt., No. 354 (as *Paxillus tammii*).
Ricken, Blätterpilze, Pl. 28, Fig. 1.
Atkinson, Mushrooms, Pl. 47, Fig. 156, 1900.
Hard, Mushrooms, Fig. 234, p. 289, 1908.

PILEUS 4-9 cm. broad, firm, convex, then expanded, depressed or obtuse, somewhat turbinate, color varying *reddish-yellow-brown to chestnut brown,* sometimes pale cinnamon-brown, minutely tomentose, glabrescent, dry, often rimosely cracked. FLESH thick at

disk, pallid tinged yellowish. GILLS long, decurrent, arcuate, thickish, rather broad toward stem, close to subdistant, *golden-yellow to chrome-yellow,* sometimes forked, *very intervenose,* sometimes reticulate-porose toward stem. STEM 4-8 cm. long, 5-10 mm. thick, equal or ventricose, solid, pale, reddish-yellow, yellow at base, punctate with small, reddish-brown scales or dots. SPORES elongated-oblong, almost fusiform, 9-12 x 3-4.5 micr., yellowish in mass. CYSTIDIA numerous on edge and sides of gills, clavate-lanceolate, 60-70 x 9-15 micr., filled with yellowish content. ODOR and TASTE mild.

Gregarious or scattered. On the ground or among mosses in frondose or conifer woods. Ann Arbor, Bay View. July-August. Infrequent.

This species appears to represent a link between the Boletaceae and the Agaricaceae. The top of the pileus may easily be mistaken for *Boletus subtomentosus* and in its extreme variation the gills anastomose to such an extent as to almost appear porose near the stem. The plant has been placed in Gomphidius, Flammula, and Clitocybe, while Bresadola erected the genus Phylloporus for it, where it might well be left. The plant was first described by Rev. David de Schweinitz from specimens gathered in North Carolina. It occurs also in Europe where it has had a variety of names.

279. Paxillus involutus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 875.
Gillet, Champignons de France, No. 514.
Berkeley, Outlines, Pl. 12, Fig. 5.
Michael, Führer, f. Pilzfreunde, Vol. I, No. 30.
Ricken, Blätterpilze, Pl. 28, Fig. 2.
Swanton, Fungi, Pl. 40, Fig. 7-8.
Atkinson, Mushrooms, Fig. 155, p. 166, 1900.
Hard, Mushrooms, Fig. 232, p. 287, 1908.
Peck, N. Y. State Mus. Rep. 48, Pl. 28, Fig. 18-23.

PILEUS 4-9 cm. broad, convex then expanded-depressed, firm, pliant in age, *ochraceous-rusty-brown, reddish-brown or olive-brown,* somewhat cottony-tomentose, margin *at first involute* then spreading and furrowed or ridged, sometimes subviscid, shining in spots when dry. FLESH thick, yellowish-pallid, becoming brownish

when bruised. GILLS decurrent, arcuate, crowded, rather broad, *anastomosing, or reticulated-porose on the stem,* olivaceous-yellow *becoming brown when bruised.* STEM 4-6 cm. long, 1-2.5 cm. thick, solid, glabrous, even, central or eccentric, somewhat enlarged at base, dingy yellowish-brown or concolor. SPORES broadly elliptical, pallid, rusty-ochraceous, 7-9 x 5 micr., smooth. CYSTIDIA moderately abundant or scattered, lanceolate, 50-70 x 10-12 micr. ODOR and TASTE mild. *Edible.*

Solitary or scattered. On the ground or among forest debris, sometimes at the sides of logs or base of stumps, etc. More common in the coniferous regions of the State, rather infrequent elsewhere. Isle Royale, Houghton, Marquette, Bay View, New Richmond, Detroit, Ann Arbor, etc. July-October. Common in the north.

The dingy and dull colors are somewhat variable in various stages of development. It is not usually an attractive plant because of the hues assumed by the flesh, etc., in age. I have but seldom found it in the southern part of the State or where conifers are absent.

280. Paxillus atrotomentosus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 876.
Gillet, Champignons de France, No. 512.
Michael, Führer f. Pilzfreunde, Vol. I, No. 29.
Ricken, Blätterpilze, Pl. 28, Fig. 4.
Atkinson, Mushrooms, Fig. 157, p. 169, 1900.
Hard, Mushrooms, Fig. 233, p. 288, 1908.

PILEUS 5-12 cm. broad, firm, tough, convex then plane or depressed, dry, more or less pruinose-tomentose, at length naked, *rusty-brown to blackish-brown,* even, margin at first involute, persistently incurved. FLESH thick, compact to spongy, white. GILLS adnate-decurrent, separable from the pileus, close, rather narrow, *forked behind* and often anastomosing, sometimes porose on stem. STEM 3-12 cm. long, 1-3 cm. thick, *often eccentric, stout,* solid, tough, straight or curved, arising from a rooting base, *covered by a blackish-brown velvety tomentum.* SPORES oval, smooth, 5-6 x 3-4 micr., yellowish in mass. CYSTIDIA none. ODOR and TASTE slight. *Edible.*

Solitary or caespitose. On decaying logs, stumps, etc., or base

of trees, in coniferous woods. Huron Mountains, Bay View, Saginaw, New Richmond. July-September. Infrequent.

Very distinct by the blackish hairs which clothe the stem. It is apparently limited to wood or debris from coniferous sources. Occasional specimens attain quite a large size and often occur singly at the base of pine trees. The cap is sometimes nearly lateral especially when growing in tufts.

281. Paxillus corrugatus Atk.

Mushrooms, p. 170, 1900.

Illustration: Ibid, Pl. 48, Fig. 158.

PILEUS 2-5 cm. broad, *lateral, shelving,* narrowed down in an irregular wedge-form to the sessile base, convex then expanded, *maize-yellow to canary-yellow,* with a reddish-brown tinge near the base, glabrous or slightly tomentose, margin at first involute. FLESH pale yellow, spongy. GILLS 2-3 mm. broad, not crowded, regularly dichotomously forked, thin, *very wavy and crenulate,* sides corrugated, *orange-yellow,* easily separating from pileus. STEM lacking. SPORES minute, broadly-elliptical to oval, 3 x 1.5-2 micr., faintly yellow, olive-yellow on white paper. ODOR characteristic, disagreeable.

On hemlock stumps or wood. Houghton, Marquette. August-September. Infrequent or rare.

Known best by the deep orange-yellow color of the corrugated gills and the lack of a stem.

282. Paxillus panuoides Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 878.
Berkeley, Outlines, Pl. 12, Fig. 6.
Michael, Führer f. Pilzfreunde, Vol. III, No. 50.
Ricken, Blätterpilze, Pl. 28, Fig. 3.

PILEUS 3-12 cm. broad, *sessile,* or laterally extended to a stem-like base, *petaloid* or *conchate,* dull yellow to olivaceous-yellow, tinged with brown, downy at first, glabrescent, margin thin, acute, wavy or crisped. FLESH white, soft, not very thick. GILLS radiating from the base, forked, anastomosing, *often crisped,* close,

pale yellow. STEM lacking. SPORES elliptical, smooth, 4-6 x 3-4, pale yellow in mass. CYSTIDIA none. ODOR and TASTE mild.

Gregarious or subimbricate. On decaying logs, etc., in coniferous woods.

Houghton, Munising, Bay View. July-August. Infrequent.

Paler and with less corrugated gills than the preceding. It is said to be very variable in form and habit. In Europe it occurs in dark places, in cellars, mines, etc., attached to the timbers. It appears to be much less common in this country.

Pholiota Fr.

(From the Greek *Pholis,* a scale.)

Ochre-brown or rusty spored. Stem continuous with the pileus, provided with a *membranous annulus,* which is formed from a partial veil; no volva, hence no universal veil; gills *adnate becoming emarginate* or decurrent by a tooth, sometimes adnexed.

Putrescent, terrestrial or lignicolous mushrooms, of great variability of types. They correspond to Armillaria of the white-spored group, and Stropharia of the purple-brown-spored group. The nearest genera are Flammula and Cortinarius whose veils differ, when present, in being cortinate. The large, wood-inhabiting species are often densely caespitose. None are known to be poisonous, and many are excellent when cooked.

The PILEUS varies according to the section to which it belongs. In one section it is often very scaly, in the others it is usually glabrous. It may be dry or hygrophanous. The color is usually whitish or dull yellowish in the first section. Those growing on wood are often very attractive, with bright yellow colors, in *P. aeruginosa* tinged with dark green, and in others a watery-brown. The GILLS are attached to the stem, adnate, adnexed, or decurrent by a tooth; in all these cases, the gills may secede from the stem during the expansion of the pileus, and they nearly always become emarginate or sinuate at maturity. This separates them from the genus Flammula whose gills never become sinuate. The color changes from the young condition to maturity and it is necessary in many cases to know the color of the young gills to identify the species; this is usually white or yellow, but at length changes to the color of the spores, which are either ochraceous, fuscous or ferruginous. The STEM is fleshy or fibrous, solid or stuffed, and provided with a membranous *annulus* which is either persistent or

may break up into easily removed shreds, so that it may appear to be lacking in rainy weather. The SPORES are elliptical or oval, non-angular except obscurely so in a few species, e. g. *P. acericola, P. howeana* and *P. aegerita;* in *P. aggericola* they are often somewhat pear-shaped. The color when caught on white paper varies considerably, and has been used to subdivide the sections. CYSTIDIA are present only in two sections, as far as is known, viz. in the Humigeni and Hygrophani. This fact may serve as a basis for raising these sections to generic rank, as has been done by Earle and others.

The genus Pholiota furnishes some excellent species for the table. *P. praecox* and its near relatives are among the early edible mushrooms, and as they occur on lawns and grassy places are within easy reach. A number of the large, caespitose forms, like *P. squarrosa, P. squarrosoides* and *P. adiposa* are among those eaten, and in Europe *P. mutabilis* is highly prized as an ingredient of soups, and is often artificially cultivated on the wood on which it is found. On the other hand, wood-inhabiting Pholiotas as well as others, are apt to have a strong odor or taste, derived from the wood, and this does not always disappear on cooking. As far as known, no virulent poisons are present in any of this genus.

The genus is rather large, but many species are found rather infrequently. The following key includes most of the species reported for the north-eastern United States, and no doubt some which are not yet described will be discovered from time to time. Fries divided the genus into three sections; to these I will add the subdivision Hygrophani, as they seem to stand out sufficiently clear from the rest of the species. The four sections follow:

I. Humigeni
II. Truncigeni
III. Hygrophani
IV. Muscigeni

Key to the Species

(A) Pileus viscid when moist. [See also (AA) and (AAA).]
  (a) Pileus scaly; often very caespitose; on wood, sometimes on debris.
  (b) Pileus bright yellow.
    (c) Gills broad, adnate then emarginate, at first yellow; pileus very viscid, ochre-yellow.
    (cc) Gills narrow. 297. *P. adiposa* Fr.
      (d) Gills yellow at first; pileus sulphur-yellow, covered with tawny or reddish-brown scales; stem peronate. 299. *P. lucifera* (Lasch.) Bres.
      (dd) Gills whitish at first; pileus lemon-yellow. *P. limonella* Pk.
  (bb) Pileus not at all or tinged slightly with yellow.

(c) Pileus tinged red, pink or purplish; subcaespitose; gills white or yellow-tinged at first. *P. ornella* Pk.
(cc) Pileus not with red or pink.
(d) Very caespitose; pileus and stem with dense, erect or recurved tawny scales on buff ground-color. 290. *P. squarrosoides* Pk.
(dd) Solitary or very few in one tuft.
(e) Edge of gills beaded with white drops; pileus yellowish-fulvous, spotted with removable scales. 291. *P. albocrenulata* Pk.
(ee) Edge of gills not beaded; pileus yellowish-white or sometimes darker; stem bulbous-radicate. 289. *P. destruens* (Lasch.) Bres. (syn. *P. comosa* Fr.), (syn. *P. heteroclita* Fr.)
(aa) Pileus glabrous.
(b) Spores large and variable, 10-15 micr. long, pileus dark brown or blackish brown; on the ground in woods. 288. *P. aggericola* Pk.
(bb) Spores 9 micr. or less in length.
(c) On decaying logs, etc.; pileus hygrophanous, rufous-cinnamon (moist). 304. *P. discolor* Pk.
(cc) On lawns, grassy places, etc.; pileus whitish-buff or white, thick. 283. *P. praecox* Fr.
(AA) Pileus hygrophanous, not viscid.
(a) Growing on moss or sphagnum; pileus small; stem slender to filiform; annulus membranous.
(b) Pileus umbonate; stem solid; annulus slight. *P. minima* Pk.
(bb) Pileus not umbonate; stem hollow; annulus persistent, entire. 308. *P. mycenoides* Fr.
(aa) On decaying logs, stumps, chips, saw dust, etc., sometimes on debris in woods, or on the ground.
(b) Gills at first yellowish or ochraceous.
(c) Large; pileus 5-10 cm. broad, cinnamon (moist); annulus fugacious; flesh yellowish. *P. cerasina* Pk.
(cc) Much smaller; annulus persistent.
(d) Gills broadly adnate, subtriangular; appearance of *P. marginata*, subcaespitose. 305. *P. unicolor* Fr.
(dd) Gills adnexed, relatively broad; solitary; pileus small, rugose. 307. *P. rugosa* Pk.
(bb) Gills never with yellowish tints.
(c) Very caespitose; pileus yellow-cinnamon to pale cinnamon; stem squarrose-scaly, below the blackish-brown annulus. *P. mutabilis* Fr.
(cc) Gregarious; stem not scaly.
(d) Annulus fugaceous, small, scarcely membranous; gills narrow; pileus watery-cinnamon. 306. *P. marginata* Fr.
(dd) Annulus ample, membranous.
(e) Pileus densely floccose-dotted, rufous-cinnamon to brick-red; very fragile. 303. *P. confragosa* Fr.
(ee) Pileus glabrous, rugose-wrinkled, ochraceous-cinnamon then paler. 302. *P. acericola* Pk.
(AAA) Pileus neither viscid nor hygrophanous.
(a) Pileus scaly; on wood, logs, trunks, etc.
(b) Gills yellow, at length ferruginous.
(c) Pileus silky, floccose-squamulose on disk, buff-yellow; taste bitter; annulus fugacious. *P. lutea* Pk.
(cc) Pileus entirely squamulose.
(d) Scales sulphur-yellow, superficial, pilose; stem squarrose-scaly, hollow. 298. *P. flammans* Fr.
(dd) Scales innate, i. e., by the breaking up of the cuticle.
(e) Gills narrow, adnato-decurrent; pileus golden-yellow to tawny; annulus ample, near apex of ventricose stem.

296. *P. spectabilis* Fr.

(ee) Gills broad.

(f) Pileus and stem variegated yellow and green, or with greenish scales; on exposed, hard wood. 301. *P. aeruginosa* Pr.

(ff) Pileus without green shades.

(g) Stem hollow at length; pileus covered with ferruginous, pointed, fasciculate scales. 295. *P. muricata* Fr.

(gg) Stem solid; pileus pale red or yellowish; gills subdistant. 300. *P. luteofolia* Pk.

(bb) Gills not yellow at first, (becoming yellowish in *P. curvipes*).

(c) Very caespitose; pileus and stem squarrose-scaly; gills pallid-olivaceous at first, narrow. *P. squarrosa* Fr.

(cc) Solitary or subcaespitose.

(d) Stem bulbous, subradicate, solid; gills rounded-adnexed or adnate. (Dry condition.) 289. *P. destruens* Fr.

(dd) Stem equal, stuffed then hollow.

(e) Pileus small, 2-3 cm. broad.

(f) Pileus covered with superficial, erect, small spine-like scales, tawny-brown. 294. *P. erinaceella* Pk.

(ff) Pileus with innate, flocculose minute scales. 293. *P. curvipes* Fr.

(ee) Rather large, 6-12 cm. covered with appressed, tawny fibrillose scales; gills narrow; annulus ample. 292. *P. fulvosquamosa* Pk.

(aa) Pileus not scaly; growing on the ground.

(b) In moist, rich woods.

(c) Moderately large.

(d) Large; pileus covered with white flocci, lacunose-wrinkled; annulus large, persistent and movable. 284. *Pholiota caperata* Fr.

(dd) Pileus glabrous; disk ochre-yellowish.

(e) Gills adnexed or nearly free; stem solid; annulus thick. 285. *P. johnsoniana* Pk.

(ee) Gills adnate, decurrent by a tooth; stem hollow; annulus ample; caespitose. 286. *P. aegerita* Fr.

(cc) Small; pileus ochraceous; spores 7-8 x 3-4; annulus membranous, distant; gills yellowish. *P. togularis* Fr.

(bb) On lawns, grassy places, etc., medium size.

(c) Stem solid, hard. Pileus tan-color but variable; in cultivated fields and gardens. 284. *P. dura* Bolt.

(cc) Stem stuffed then hollow; pileus varying white, whitish tinged with tan or yellowish.

(d) Open places, in fields, thickets, etc. Spores 9-10.5 x 5-5.5, obscurely 5-angled. 287. *P. howeana* Pk.

(dd) Annulus membranous, fragile, subfugacious, brown in mass. *P. duroides* Pk.

(ddd) Annulus membranous, fragile, subfugacious.

(e) On lawns, etc., in the spring; spores 8-10 x 5-6 micr., pileus whitish. 284. *P. praecox* Fr.

(ee) Later in the season; spores 11-12.5 x 7-7.5 micr., similar to the preceding. 284. *P. vermiflua* Pk.

Section I. Humigeni. Terrestrial, rarely caespitose, not hygrophanous, not attached to mosses, cystidia present or absent.

283. Pholiota præcox Fr. (Edible)

Syst. Myc., 1821. (As *Psalliota praecox.*)

Illustrations: Atkinson, Mushrooms, Plate 42, p. 150, 1900.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 1.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 27 and 28, 1913.
Hard, Mushrooms, Fig. 209, p. 258, 1908.
Marshall, Mushroom Book, Pl. 30, p. 84.
Ricken, Blätterpilze, Pl. 55, Fig. 4.
Patouillard, Tab. Analyt., No. 112.
Peck, N. Y. State Mus. Mem. 4, Plate 57.
Plate LIX of this Report.

PILEUS 2-6 cm. broad, convex or nearly plane, *soft,* glabrous, or nearly so, even, *moist,* in wet weather often slightly viscid to the touch, *whitish* or *more or less tinged* with yellowish or leather-color when old, margin at first incurved. FLESH white, medium thick. GILLS adnate seceding or becoming emarginate, somewhat rounded behind, close, of medium width, *at first whitish, then tinged gray, finally brownish or rusty brown,* edge crenulate. STEM 3-8 cm. long, 3-5 mm. thick, rather slender, equal or subequal, *usually straight,* glabrous, apex pruinose, almost solid or *stuffed by a fibrous white pith,* even or striate at apex, whitish. VEIL whitish, thin and frail, *breaking variously,* sometimes forming a thin, fragile ANNULUS, sometimes adhering in shreds to the margin of pileus. Annulus apical, fugacious. SPORES elliptical, 9-13 x 6-7 micr., smooth, rusty-brown in mass. CYSTIDIA scattered, swollen-ventricose with short, broad apex, 35-45 micr. long, 12-15 micr. thick. ODOR farinose. TASTE mild.

Solitary or gregarious, rarely subcaespitose. On lawns, pastures, roadsides, etc., sometimes in woods. Throughout the State. Common in May and early June, after heavy rains.

One of our early edible mushrooms; easy to get, as it grows at our very doors. It has several near relatives and varies somewhat when growing in the woods. Peck has called the wood form var. *sylvestris;* the cap is darker, brownish to rusty-brown. Another form, because of its small size (pileus 2-3 cm.) and appendiculate margin of the pileus, was called var. *minor* by Fries.

The normal form varies also; in wet weather the pileus is subviscid, while ordinarily it is dry. The gills of different specimens are attached differently to the stem, adnexed, adnate or even slightly decurrent at times; on expansion of pileus, however, they become sinuate or emarginate; their edge is whitish-crenulate because of the cystidia. Sometimes the base of stem is attached to white strands which enter the turf. The stem is almost homogeneous at first. *P. vermiflua* Pk. is closely related to it. (See illustration: N. Y. State Mus. Bull. 75, Plate 73, 1904.) Authors differ somewhat as to the spore measurements, and may have confused other species with *P. praecox, P. dura* Fr. (see illustration: Hard, Mushrooms, Fig. 210, p. 259) has not been detected in Michigan but doubtless grows here. Its solid stem, tan to brownish pileus, which usually cracks on the surface into areas, and its preference for soil which has been cultivated, distinguish it. Ricken gives the spore-size of *P. dura* as 11-13 x 7-8 micr. *P. temnophylla* Pk. is separated by Peck, on account of its dingy-yellow or ochraceous cap and *very broad gills.* One specimen, which may be this species, was collected in hemlock and spruce woods, Sault Ste. Marie; the very broad gills were obliquely truncate at the inner extremity, but the spores were somewhat smaller than given by Peck. Otherwise it resembles *P. praecox.* Not infrequently specimens of *P. praecox* having the characters of the type rather than those of var. *sylvestris* are found in low, moist woods.

284. Pholiota caperata Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 348.
Ricken, Blätterpilze, Pl. 55, Fig. 2.
Michael, Führer f. Pilzfreunde, Vol. I, No. 49 (as *Rozites caperata*).
Gillet, Champignons de France, No. 520.
Hard, Mushrooms, Pl. 31, Fig. 212.
Harper, Trans. Wis. Acad. Sci. Arts & Let., Vol. XVII, Pt. 1, Pl. 24.

PILEUS 5-10 cm. broad, oval at first, campanulate-expanded, obtuse, markedly wrinkled or furrowed, dry, *at first with a superficial hoariness or floccosity,* straw-color to alutaceous, at length glabrous. FLESH white, thick on disk. GILLS adnate, then

emarginate, medium close, whitish then *dingy* pale ferruginous, edge uneven or crisped. STEM *stout,* 7-12 cm. long, 10-20 mm. thick, subcylindrical, firm, solid, glabrous, dingy white, furnished *near the middle with a reflexed, persistant, whitish, membranous annulus.* SPORES 12-14 x 7-9 micr., inequilateral, elliptical, tuberculate, yellowish. ODOR and taste mild.

Gregarious or scattered. On the ground in woods, especially of conifers. Ann Arbor, Bay View, Marquette, etc. August-September. Frequent locally.

This species has been separated from the Pholiotas by Karsten who invented the genus Rozites for it. It is quite distinct from the other species by its peculiar covering when young. Its stout stem, distinct annulus, large size and terrestrial habit make it easily recognizable.

285. Pholiota johnsoniana (Pk.) Atk. (Edible)

N. Y. State Cab. Rep. 23, 1872 (as *Psalliota johnsoniana*).
N. Y. State Mus. Rep. 41, 1888 (as *Stropharia johnsoniana*).

Illustration: Atkinson, Mushrooms, Plate 44, p. 145, 1900.

PILEUS 4-10 cm. broad, convex then plane and subturbinate, *glabrous, ochre-yellowish,* often shading to whitish on margin which is *thin* and sometimes finely striate. FLESH *quite thick on disk,* white, soft. GILLS *adnexed or almost free,* rounded behind, thin, crowded, rather narrow, grayish-white at first, then rusty-brown, at length ascending toward front. STEM 5-10 cm. long (or more), 6-10 mm. thick, equal or slightly thickened at base, *solid,* glabrous, innately fibrillose, rarely floccose-torn, whitish. SPORES elliptical-oval, 5-6 x 3-4 micr., smooth, brown with a slight rusty tinge. CYSTIDIA none, but scattered over the hymenium are *clusters of stellate crystals.* ANNULUS *thick,* swollen, with obtuse edge.

(Dried: Pileus yellowish-alutaceous; gills fuscous-umber; stem buff).

Gregarious. On leaf-mould in rich woods; also said to occur in pastures. Ann Arbor. September. Rare.

As Atkinson points out, the plant is quite readily distinguished by its subturbinate (i. e. top-shaped) pileus and the thick annulus. Variations occur with erect tawny squammules on the center of the pileus, or with its surface innately floccose or fibrillose. The base of the stem is sometimes connected with the soil by white strands of

mycelium. A constant peculiarity of the plant seems to be the clusters of stellate crystals which are scattered among the basidia as seen under the microscope.

286. Pholiota aegerita Fr.

Epicrisis, 1836-38.

Illustrations: Gillet, Champignons de France, No. 524.
Cooke, Ill., Plates 453, 365.

PILEUS 4-7 cm. broad, convex then plane, margin at length elevated, fragile, moist, glabrous, disk subrugulose, *ochraceous-yellow to fulvous,* paler on margin, edge even and thin. FLESH not thick, white. GILLS *adnate,* decurrent by a tooth, rather close, broad, whitish at first, then grayish fuscous, finally umber. STEM 8-12 cm. long, 4-8 mm. thick, slender, equal or slightly thicker at base, fibrillose-striate, floccose at base, *stuffed then hollow,* whitish. ANNULUS whitish, membranous, rather thin, sometimes disappearing. SPORES *obscurely* 5-angled, i. e. truncate at one end, subacute at the other, 9-11 x 5-6 micr., fuscous umber. CYSTIDIA scattered, ventricose, obtuse at apex, about 65-70 micr. long.

(Dried: Pileus fulvous-tan; gills fuscous-umber; stem dingy buff).

Caespitose. Among debris in low grounds, poplar, willow, etc., edge of hemlock woods. Houghton. July. Rare.

The figures and description given by Gillet fit our plant well. The spores agree with the size given by Ricken and Bresadola. The caespitose habit, uneven pileus and slender, hollow stem characterize it. It doubtless varies more as to form than my specimens indicate, and Cooke has given very aberrant examples in the figures cited. The peculiar outline of the spores is shown also in *P. acericola* and *P. howeana.* The flesh is very moist, almost hygrophanous, but in other respects differs from the section of hygrophanous species. It approaches *P. acericola,* which has slightly smaller spores and a large, persistent, curtain-like annulus, and is solitary or gregarious. Fries says the annulus is tumid, in which respect our specimens differ. Harper figures a plant under this name, which reminds one of a discolored form of *P. aeruginosa* Pk. Ricken says it has a strong, rather pleasant odor.

287. Pholiota howeana Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1.5-5 cm. broad, convex expanded, fragile, subumbonate, dry, glabrous, even, pale ochraceous, unicolor or center darker. FLESH white. GILLS adnate, with a tooth, *narrow,* close, subventricose, white at first then rusty-brown, edge entire and concolor. STEM 3-7 cm. long, 1.5-4 mm. thick, *slender, equal,* rather rigid, corticate, glabrous, even, stuffed with white pith, whitish to pale ochraceous. ANNULUS apical, thin, membranous, and easily rubbed off. SPORES *obscurely* 5-angled or sub-regular, truncate at one end, pointed at the other, 9-10.5 x 5-5.5 micr., fuscous-brown. CYSTIDIA none or very few. ODOR and TASTE mild.

(Dried: Pileus and stem pale-tan, gills rusty-brown.)

Gregarious. In grassy fields. Ann Arbor. June. Infrequent.

Our collections average smaller than Peck's description. The slight angularity of the spores is obscure but easily made out. In shape it looks like a small *P. praecox* but the colors differ and the stem has a different texture. The pileus is sometimes slightly pitted-lacunose on the margin. In size and appearance it resembles *Naucoria semiorbicularis,* but with an annulus; it also approaches Peck's *P. temnophylla;* but that species has very broad gills and the spores are larger.

288. Pholiota aggericola Pk.

N. Y. State Mus. Rep. 24, 1872.
N. Y. State Mus. Rep. 30, 1878 (as *Pholiota indecens* Pk.).
N. Y. State Mus. Bull. 28, 1899 (as *Pholiota aggerata* Pk.).

Illustrations: Marshall, Mushroom Book, p. 73.
(Compare Cooke's Ill., Plate 358 of *P. erebia.*)
Harper, Wis. Acad. Sci. Trans., Vol 17, Pl. 30 (as *P. erebia* Fr.).

PILEUS 1.5-4 cm. broad, convex then plane and at length with recurved margin, *viscid,* dark fuscous-umber, fading to cinnamon, glabrous, *even, rivulose* or *rugose,* margin obscurely striatulate. GILLS *adnate or arcuate subdecurrent,* close to subdistant, rather broad behind and subtruncate, pallid at first, then grayish, finally rusty-brown. STEM 3-6 cm. long, 4-7 mm. thick, equal or subequal,

fibrillose-striate, stuffed then hollow, dark fuscous-umber below, pale at apex. ANNULUS membranous, thin, *fragile,* veil fuscous and striate above, pale below; veil sometimes adhering to margin of pileus. SPORES variable in size and shape, *long elliptical,* to *subpyriform,* 12-15 x 5-7 micr., sometimes dominantly 12 micr., sometimes 15, smooth, on slender sterigmata. BASIDIA *bispored.* CYSTIDIA nine-pin shaped, or lanceolate, 40-50 micr. long, scattered, fragile, shorter on edge of gills.

Gregarious. In hemlock mixed woods in paths or among debris, usually in moist ground. Bay View, Houghton, Marquette, New Richmond. July-October. Rather frequent locally.

This species has a confused history. It was given several names by Peck. Under *P. indecens* Peck gives spore-measurements 12-15 micr. long, but in his monograph of the New York State Pholiotas, they are said to be 10-12.5 micr. long. This discrepancy is due to spore variations in different individuals as I have assured myself. Often many spores of a specimen are less than 12 micr., but the majority of collections show a dominance of spores 15 micr. long. Often they vary much in the same specimen. This plant prefers low, moist hemlock woods although it is found elsewhere. Its viscid character disappears in dry weather, and the pileus in luxuriant plants is often very rugose; this is var. *retirugis* Pk. The European species, *P. erebia,* as figured by Cooke and Patouillard remind one very much of our plant. But the pileus of that species is described as hygrophanous although Fries says it is also subviscid. The cystidia are also figured differently by Patouillard, yet I should not be surprised if our plant were to turn out to be identical with *P. erebia* Fr. Some specimens have a distinct fuscous-purplish tinge to the gills, and the spores under the microscope suggest a Stropharia rather than a Pholiota; but this character also seems variable, even where spores and cystidia are the same.

Section II. Truncigeni. Lignatile, caespitose or solitary. Pileus scaly, not hygrophanous. Gills changing color. Cystidia lacking.

**Gills at first white or whitish.*

289. Pholiota destruens (Fr.) Bres.

Fungi Tridentini, I, 1881.

Hymen. Europ., 1874. (As *Pholiota destruens* Fr., *Pholiota comosa* Fr., and *Pholiota heteroclita* Fr.).

Illustrations: Bresadola, Fung. Trid., I, Plate 84.
Cooke, Ill., Pl. 600 (as *Pholiota comosa*).
Cooke, Ill., Plate 366 (as *Pholiota heteroclita*).
Gillet, Champignons de France, No. 522.
Gillet, Champignons de France, No. 521 (as *Pholiota comosa*).
Hard, Mushrooms, Fig. 214, p. 264, 1908 (as *Pholiota heteroclita*).
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 45 (as *P. comosa*).
Harper, ibid, Pl. 46 and 47 (as *P. heteroclita*).
Chicago Nat. Hist. Surv., Bull. VII, Plate 9, 1909 (as *Pholiota comosa*).
Plate LX of this Report.

"PILEUS 6-15 cm. broad, fleshy, convex then expanded, sometimes gibbous or broadly unbonate, *subviscid,* yellowish-white, disk fulvous, *elegantly covered with white, wooly, seceding scales,* margin at first involute and fibrillose. GILLS crowded, rounded-adnexed behind or adnate, decurrent by a line, *whitish at first* then cinnamon-umber. STEM 5-17 cm. long, 2-3 cm. thick, solid, attenuated at apex, bulbous-radicate at base, white-squamose, glabrescent in age, concolor. FLESH white, fulvous-cinnamon at base of stem. SPORES elliptical, or obovate, 8-10 x 4-6 micr., yellow under microscope. BASIDIA clavate, 20-25 x 6 micr. ODOR strong, somewhat nauseous. TASTE rather agreeable."

Solitary or subcaespitose. On trunks of poplar, birch and willow. Autumn. Detroit, Frankfort. Infrequent.

The description is that of Bresadola, who has shown the identity of the three species given by Fries (see above). It was collected by Dr. Fischer near Detroit and one of his photographs was published by Hard as *P. heteroclita.* It seems to be rare in the state. Harper recently reported it from Frankfort.

290. Pholiota squarrosoides Pk. (Edible)

N. Y. State Mus. Rep. 31, 1879.

Illustrations: Peck, N. Y. State Mus. Rep. 54, Plate 73.
Hard, Mushrooms, Plate 21, p. 42, 1908.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 36 and 37.
Conn. State Geol. & Nat. Hist. Surv. Bull. 3, Plate 21.

PILEUS 3-10 cm. broad, *firm,* subglobose when young, then convex,

viscid when moist, adorned with terete, erect, pointed, tawny scales, more dense on disk, on a whitish ground-color. FLESH white, thick. GILLS rather narrow, adnate or arcuate subdecurrent, often becoming sinuate in age, close or crowded, whitish becoming brownish-ferruginous. STEM 5-10 cm. long, 5-10 mm. thick, equal, firm, *stuffed, rough* with numerous, thick, floccose, tawny scales, which terminate above in a lacerated, floccose ANNULUS, glabrous and white above the annulus. SPORES oblong, short-elliptical to ovoid, 5-5.5 x 2.5-3.5 micr., smooth, rusty-brown. CYSTIDIA scattered, about 30 micr. long, obtuse at apex.

(Dried: Ochraceous, with tawny scales.)

Very caespitose, up to 50 in a cluster. On trunks of living maple, birch and beech, also on dead wood: logs, stumps, etc., of deciduous trees. Northern Peninsula, frequent; not found elsewhere. August-September. Edible.

The "sharp scale" Pholiota is closely related to the European *P. squarrosa.* It is said (N. Y. State Mus. Rep. 54, p. 183) to differ in the viscid pileus, emarginate gills and smaller spores. The gills, however, are not constant, and frequently I have seen our plant with arcuate-decurrent gills, without a sign of emargination. In 1908 in company of C. G. Lloyd, I came across a tuft of a Pholiota in the grounds of Upsala University, Sweden, which had all the macroscopic characters of our plant; it was slightly viscid (moist), and the colors were the same as in the specimens collected in northern Michigan. Unfortunately, I was unable to get the spore-measurements. Fries in Epicrisis, p. 166, says the color of *P. squarrosa* is croceo-ferruginous, and it is thus figured by Michael, Vol. II, No. 76, and Cooke, Ill., Plate 367. On the other hand, Patouillard in Tab. Analyt., p. 154 and No. 340, paints it like our species and unites with it *P. verruculosa* Lasch. which Cooke in Illust., Plate 614, figures in such a way as to remind us strongly of *P. squarrosoides.* Either the American plant occurs in Europe also, or there is great variation in the color of *P. squarrosa,* both of cap and gills. The gills of the latter are said by all the European authors, to be pale olivaceous at first, and the spore measurements are given as 8 x 4. Maire (Soc. Myc. France Bull., Vol. 27, p. 437) says the spores are smooth. Further, the odor of *P. squarrosa* is said to be strong, disagreeable. Patouillard, Gillet and Michael describe the flesh as yellow. *P. squarrosa* may then be said to differ from *P. squarrosoides,* in the color of the young gills, the disagreeable odor, the yellow flesh, the crocus-yellow or tawny color, and the larger, smooth spores. It has been reported from the United States by various authors; and it

seems desirable that the two species be more carefully studied. I have never found a plant in Michigan which could be referred to *P. squarrosa,* but Harper has illustrated collections from Frankfort, Michigan, under the latter name.

291. Pholiota albocrenulata Pk.

N. Y. State Mus. Rep. 25, 1873.

Illustration: Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 42 and 43.

PILEUS 3-12 cm. or more broad, firm, broadly convex or campanulate, often unbonate, *very viscid,* orange-fulvous, becoming ferruginous-tawny in age, *spotted with superficial, darker, fibrillose, scales which become whitish on drying,* margin even and at length reflexed, often appendiculate. FLESH thick, *whitish.* GILLS adnate, becoming sinuate and rounded behind, *very broad,* close, whitish at first, then grayish, at length rusty-umber, *edge crenulate and beaded with white drops.* STEM 5-15 cm. long, 5-10 mm. thick, firm, equal or tapering slightly upward, stuffed by a loose pith, soon hollow, dingy whitish or ochraceous, *covered with squarrose, brown scales* up to the fugacious ANNULUS, apex pruinose and white. SPORES ventricose-subfusiform, inequilateral, 11-14 x 5.5-6.5 micr., smooth, rusty-umber. CYSTIDIA none.

Solitary, or two or three in a cluster. Mostly growing out of a crack or wound of living trees, towards the base of the trunk; on living sugar maple, yellow birch and hemlock. July-September. Frequent in the Northern Peninsula, rare in southern Michigan.

This fine plant prefers the sugar maple, and may yet be found to be injurious to the living trees, as it has the characteristic habit of parasitic mushrooms. Peck and Harper report it on prostrate trunks and decaying wood, but I have always found it on living trees. Morgan also reports it from Ohio on the base of standing maple trees. The white-headed edge of the gills, the peculiar scales and large spores distinguish it. The spores average longer than noted by Peck, although they vary considerably in length. The pileus may attain to quite large dimensions. Its edibility is unknown.

292. Pholiota fulvosquamosa Pk.

Torr. Bot. Club. Bull. 30, 1903.

Illustration: Harper, Wis. Acad. Sci. Trans., Vol 17, Pl. 60.

"PILEUS 6-12 cm. broad, fleshy, rather thin, convex becoming nearly plane, *dry,* adorned with numerous, appressed, tawny scales, concentrically cracked about the disk. FLESH white, becoming brownish where cut. GILLS *narrow,* close, attenuated towards the stem and attached to a narrow collar, whitish becoming pinkish-cinnamon. STEM 5-8 cm. long, 8-10 mm. thick, equal, rigid, stuffed or hollow, adorned below with numerous, erect, subfloccose, tawny scales, glabrous above and below the *ample, persistent* ANNULUS, which is white above and tawny floccose-squamulose below. SPORES elliptical, 7-8 x 4-5 micr. ODOR and TASTE of radishes."

About the base of oak trees. M. A. C., East Lansing. September. B. O. Longyear. Neebish Island, October, E. T. Harper.

I have never collected this species. It was discovered by Longyear, and found again by Harper. Its ample annulus, narrow gills, and the tawny scales seem to distinguish it.

293. Pholiota curvipes Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Plate 104.
Cooke, Ill., Plate 370.

PILEUS 1-3 cm. broad, convex then expanded, innately floccose all over when young, then minutely scaly, *tawny-yellow,* dry, not striate, margin incurved. FLESH rather thin, firm when dry. GILLS *adnate,* not emarginate, *broad,* close to subdistant, *whitish at first* then yellowish to rusty-cinnamon. STEM short, 2-3 cm. long, 2-3 mm. thick, curved or ascending, equal, stuffed then hollow, becoming fibrillose. ANNULUS soon vanishing, at first floccose-radiate, almost lacking. SPORES elliptical, 6-8 x 3-4 micr., smooth, pale-yellowish under the microscope, rusty-brown in mass. CYSTIDIA none. ODOR none. TASTE mild.

Solitary or gregarious. On logs of elm, etc. Ann Arbor. June. Infrequent.

Closely related to species of Flammula, because of its poorly developed annulus. The different color of the young gills and the

nature of the scales on the pileus, separate it from *P. muricata.* It is evident, from his description of the species (N. Y. State Mus. Bull. 122) that Peck has referred a different plant under this name, since the spores of his specimens are too large, and the gills are yellow and close. From present advices the large-spored species is probably *P. tuberculosa* Fr. On the other hand, Hard (Mushrooms, p. 264, 1908) and Moffatt (Chicago, Nat. Hist. Surv. Bull VII, p. 78) doubtless had our species. I cannot agree with those who would combine *P. muricata* Fr. with this species, although the spores are very similar.

294. Pholiota erinaceella Pk.

N. Y. State Mus. Rep. 28, 1876 (as *P. detersibilis*).

Illustration: Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 51.

"PILEUS 1-2.5 cm. broad, hemispherical or convex, dry, *densely coated with small, erect, separable pyramidal or spine-like scales,* tawny-brown. FLESH thin. GILLS adnexed, *broad,* close, pallid becoming cinnamon-brown. STEM 1-2.5 cm. long, 2 mm. thick, equal, stuffed or hollow, *densely squamulose below the slight annulus,* often curved, colored like the pileus. SPORES boat-shaped, 7.5-9 x 4-5 micr."

On logs in woods. Frankfort. August. Rare.

Reported by Harper. The description is adapted from Peck, who says that the small, soft, crowded scales of the pileus which can be easily rubbed off, constitute a prominent character of the species. Peck changed the original name in the 30th N. Y. State Mus. Rep. because it had been preoccupied. This species may be an extreme form of *P. curvipes,* which differs in the innate floccosity of the surface of the young pileus. From *P. muricata* it seems to differ mostly in its larger spores, pallid young gills, and the superficial scales on the cap.

***Gills at first yellow, becoming ferruginous.*

295. Pholiota muricata Fr.

Syst. Myc., 1821.

Illustrations: Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 52 and 53.

PILEUS 2-4 cm. broad, convex or nearly plane, dry, obtuse or depressed, *covered with dense, fasciculate or granular, tawny-yellow, pointed scales,* ferruginous on disk, not striate, margin when young often adorned by remnants of the veil. FLESH thin. GILLS adnate, seceding, moderately broad and close, *yellow* at first then ferruginous-stained, edge concolor and minutely fimbriate from the sterile cells. STEM 2-4 cm. long, 3-4 mm. thick, *curved,* stuffed then hollow, tawny, *floccose-fibrillose or granular scaly* up to the fugacious ANNULUS. SPORES short elliptical, 6-7 x 3-4 micr., smooth, pale ferruginous-brown. CYSTIDIA none.

Solitary or gregarious. On decaying logs, etc. Ann Arbor, Bay View. August-September. Infrequent.

Our plants fit well the description of Fries, except that the gills are not adnexed. They approach *P. curvipes,* but seem to me sufficiently differentiated by the pointed, fasciculate or granular scales of the cap, which are sometimes also found on the stem, and by the color of the gills which is yellow at first. *P. erinaceëla* Pk. is also close, but the scales on the cap are superficial.

296. Pholiota spectabilis Fr.

Epicrisis, 1836-38.

Illustrations: Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 44.
Fries, Icones, Plate 102.
Ricken, Blätterpilze, Pl. 55, Fig. 1, (As *Pholiota aurea*).
Cooke, Ill., Plate 352.
Gillet, Champignons de France, No. 529.
Plate LXI of this Report.

PILEUS 4-10 cm. broad, convex, then campanulate-expanded, firm, sometimes broadly umbonate, *tawny-orange,* dry, surface *glabrous at first, then broken into minute fibrillose scales,* margin even and sometimes wavy. FLESH thick, compact, yellowish, thin

at margin. GILLS adnate becoming emarginate with decurrent tooth, *narrow, crowded,* yellow then ferruginous, edge minutely floccose-fimbriate. STEM stout, 4-10 cm. long, 7-15 mm. thick, compact, often hard, *solid, subventricose, peronate-scaly,* fibrillose in age, concolor to fuscous below the ring, pruinose and paler above. ANNULUS *near apex of stem,* membranaceous, persistent, thin, mostly entire, yellowish. SPORES broadly-elliptical, 7-9 x 5-6 micr., ferruginous, *tuberculate-rough.* CYSTIDIA none, but edge of gills are tufted with sterile cells. TASTE markedly *bitter.*

Growing from the base of yellow birch trunks. Marquette, Neebish Island. August-September. Infrequent.

A very imposing and elegant plant. Its colors, narrow gills, apical annulus, bitter taste and rough spores separate this from all others. *P. adiposa* has similar colors but differs widely in all other respects. The figures of European authors show the plant with a peronate stem in its best condition and they are excellent, but somewhat misleading after the annulus has become pendant. The spores are similar to those of many Cortinarii.

297. Pholiota adiposa Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Plate 43, Fig. 144, p. 152, 1900.
Hard, Mushrooms, Fig. 211, p. 260, 1908.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 40.
Murrill, Mycologia, Vol. I, Pl. 7, Figs. 1 and 2.
Marshall, Mushroom Book, Plate XI, p. 61, 1905.
Freeman, Minnesota Plant Diseases, Fig. 129, p. 263, 1905.
Clements, Minnesota Mushrooms, Fig. 37, p. 62, 1910.

PILEUS 3-10 cm. or more broad, compact, convex to hemispherical, obtuse, *very viscid,* covered with separable, *chrome-yellow to orange concentric scales* which are darker in age and often squarrose, margin even, appendiculate, at first incurved. FLESH thick, firm, yellowish-white. GILLS adnate, becoming emarginate, *broad,* close, thin, yellow then ferruginous, toughish, edge entire. STEM stout, 3-10 cm. long, 6-12 mm. thick, *solid,* firm, usually curved, subequal, yellow, becoming ferruginous-stained from spores, *scaly,* glabrescent. ANNULUS slight, floccose, fugacious. SPORES 7-8 x 4-5 micr., elliptical, smooth, ferruginous. CYSTIDIA none,

and very short; sterile cells on edge of gills. ODOR none, TASTE mild.

Solitary or caespitose. On decaying logs, etc., and from wounds on trunks of living sugar maple and white ash. Throughout the State. June-October. Frequent, especially in the autumn. Edible.

Easily recognized by its bright color and viscid pileus. In wet weather the pileus becomes glutinous. The floccose annulus terminates the scaly part of the stem above, and is often lacking. The stem of our plant is always solid, and Fries (Hymen. Europ.) must have erroneously written "farcto," as other European authors refer to it also as solid. Massee and Ricken give spore-measurements which are too small for the American plants. Occasional specimens become larger than the size of the plant given above. The gelatinous layer of the cap should be peeled before cooking.

298. Pholiota flammans Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 104.
Cooke, Ill., Pl. 368.
Michael, Führer f. Pilzfreunde, Vol. II, No. 75 (as *Pholiota flammula* A. & S.).
Ricken, Blätterpilze, Pl. 55, Fig. 5.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 41 C.

"PILEUS 4-7 cm. broad, convex-expanded to plane, *entirely dry,* subumbonate, *fiery-yellow* to almost orange-red, *clothed by superficial, sulphur-yellow, squarrose-fibrillose scales.* FLESH bright yellow, becoming reddish-brownish. GILLS emarginate-adnexed, *very narrow,* thin, crowded, bright yellow, becoming ferruginous. STEM 5-7 cm. long, 5-10 mm. thick, equal, mostly curved, stuffed then hollow, *bright yellow,* dry, *squarrose-scaly,* up to the torn, somewhat membranous annulus. SPORES *minute,* cylindrical-elliptical, 4 x 2 micr. ODOR almost like radish."

On decaying stumps and logs, probably only on coniferous wood. Northern Michigan. September.

Known by the paler, sulphur-yellow scales on a more deeply colored background, and by the very small spores and squarrose-scaly cap and stem. It is usually caespitose. Harper reports it from Neebish Island. The description is adapted from Ricken.

299. Pholiota lucifera (Lasch.) Bres.

Fungi Tridentini, I, 1881.

Illustrations: Ibid, Plate 85.
Ricken, Blätterpilze, Pl. 54, Fig. 1.

PILEUS 3-5 cm. broad, convex then plane, at length umbonate, *viscid,* sulphur-yellow to flavus, covered on disk by tawny or reddish-brown, appressed, fibrillose, thin scales, margin even, incurved and appendiculate. FLESH whitish, yellow under cuticle. GILLS adnate-subdecurrent, becoming sinuate, *bright yellow,* at length ferruginous, moderately *narrow,* crowded, edge crenulate from the flask-shaped sterile cells. STEM 2-5 cm. long, 5-7 mm. thick, fibrous, equal or subequal, *yellow,* paler at apex, ferruginous at base, solid, *fibrillosely peronate.* ANNULUS narrow, floccose, fugacious, rusty-yellow. SPORES obovate, 7-8 x 4-5.5 micr., smooth, ferruginous in mass.

Gregarious. On very rotten wood, in mixed woods. Marquette. August-September. Rare.

This is a well-marked plant, found but once, and apparently limited to our northern woods. Our specimens had rather short stems which were solid, and in this respect differ from Bresadola's description. *P. limonella* Pk. appears to be similar, but differs in its gills which are whitish at first and adnexed. *P. adiposa* has broad gills and the scales are large and often recurved.

300. Pholiota luteofolia Pk.

N. Y. State Mus. Rep. 27, 1875.

Illustration: Harper, Wis. Acad. Sci. Trans., Vol 17, Pl. 48.

PILEUS 2-5 cm. broad, compact, convex-expanded, dry, obtuse, *scaly, dotted on disk with fasciculate-pointed pinkish to reddish-brown scales,* elsewhere areolate-cracked and with ochraceous-brown, adpressed scales. FLESH *white.* GILLS emarginate, *broad,* subdistant, *yellow* then ferruginous, edge serrate. STEM short or long, 3-6 cm. long, 4-8 mm. thick, *firm,* stuffed then hollow, curved, fibrillose, subequal, yellowish, floccose-pruinose above the slight, evanescent ANNULUS. SPORES elliptical, 7-8 x 5 micr., smooth, ferruginous in mass. CYSTIDIA none.

Subcaespitose. On decaying log of white oak. Ann Arbor. September. Rare.

Has the stature of *P. aeruginosa,* but the scales and colors differ. Our plants have pointed tuberculate scales on the disk of the pileus at first, and the stem does not remain solid.

301. Pholiota æruginosa Pk.

N. Y. State Mus. Rep. 43, 1890, Bot. ed.

Illustration: Plate LXII of this Report.

PILEUS 3-5 cm. broad, hemispherical or convex, obtuse, *firm,* subglabrous to scaly, the scales erect, pointed and mostly on the disk, *often arcolate-cracked,* dry, varying in color, *dark green, greenish or fulvous-yellow blotched with green,* the scales darker when present, margin incurved at first, often adorned with fragments of the veil. FLESH whitish, tinged green, thin except on disk. GILLS adnate and rounded behind at first, then emarginate with decurrent tooth, *broad,* close, yellowish at first, *becoming bright orange-ferruginous,* edge entire. STEM short, 3-4 cm. long, 4-8 mm. thick, equal or tapering at base, straight or curved, tough, cortex subcartilaginous, fibrillose, sulcate-striate at apex, *colored like pileus below* the lacerate, submembranaceous, fugacious ANNULUS whose remnants are soon colored by bright ferruginous spores. SPORES 6-8 x 3-4.5 micr., subelliptical, smooth, *copious,* bright ferruginous. CYSTIDIA none.

Solitary or gregarious. On old railroad ties, board-walks, old logs in woods, etc. Throughout the State; Ann Arbor, New Richmond and Marquette. June and September. Infrequent.

Like *Lentinus lepideus,* this Pholiota frequents railroad ties and other wood exposed to the light. It is a well-marked species and was found on several occasions about Ann Arbor. The colors are sometimes very striking, since the dark green of pileus and stem contrast sharply with the bright ferruginous gills and ring, while the apex of the stem is at the same time of a rosy hue. A study of a number of collections shows that there is considerable variation in color, as well as in the character of the surface of the pileus, so that Peck's description had to be revised considerably. It is one of our few green mushrooms and must not be confused with *Stropharia aeruginosa.*

Section III. Hygrophani. Pileus hygrophanous. Cystidia present on gills.

302. Pholiota acericola Pk.

N. Y. State Mus. Rep. 25, 1873.

PILEUS 2-7 cm. broad, broadly convex then plane, sometimes depressed in age, hygrophanous, glabrous, varying *rugose-reticulated to rugulose,* yellowish cinnamon (moist) often darker on disk, paler when dry, not striate on margin. FLESH rather thin. GILLS adnate becoming sinuate, close, somewhat narrow to moderately broad, pallid, or tinged gray at first, then cinnamon. STEM 4-10 cm. long, 5-10 mm. thick, equal or tapering upward, stuffed then hollow, fibrillose-striate, whitish, fuscous at base. ANNULUS *large, membranous, flabby,* persistent, deflexed, radiately striate on upper surface, and stained cinnamon by the spores. SPORES obscurely 5-angled or obovate, *truncate at one end, pointed at basal end,* 9-10 x 5-6 micr., cinnamon and tinged rusty in mass. CYSTIDIA short, much swollen below, abruptly narrowed to a short obtuse prolongation, 18-20 micr. thick below, about 25-30 micr. long, numerous on sides of gills.

On much decayed logs of hard maple and beech in mixed woods of northern Michigan, and on debris, etc., of maple woods in the south. Common around Bay View, Negaunee, Ann Arbor. June-August.

Well characterized by the reticulate-rugose pileus, the large flabby annulus and the cystidia. Individual caps vary from rugose to almost even, the latter becoming rugose on drying, rarely is the rugosity visible except under a lens. The color of the pileus is often more ochraceous than cinnamon. It prefers to grow on sugar maple wood, often on limbs or decayed twigs or on debris. Peck says the rugosity disappears on drying while in most cases I have found it to become more prominent. White mycelial strands often connect the base of the stem with the substratum.

303. Pholiota confragosa Fr.

Epicrisis, 1836-38.

Illustration: Fries Icones, Pl. 105 (3).
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 41, D. & E. (small plants).

PILEUS 2-6 cm. broad, convex-plane, obtuse, ground-color *almost brick-red,* or vinaceous-cinnamon when moist, dotted with a white flocculose coating easily rubbed off and which disappears with age, *hygrophanous,* pale whitish-tan when dry, margin striate when moist. FLESH thin, fragile. GILLS adnate, crowded, narrow, vinaceous-fawn color (Ridg.). STEM 3-8 cm. long, 2-4 mm. thick, equal, stuffed to hollow, flexuous, *rufous,* silky-fibrillose. ANNULUS apical, membranous, persistent, white below. SPORES 6-7 x 4-5 micr., even, brown. ODOR and TASTE mild. Northern Michigan. August-September. Infrequent.

The stem is said to be peronate in the young plant, with a fibrillose white coating which terminates in a spreading membranous ring; with age the ring collapses and the stem is merely fibrillose while the cap is denuded. The rufous color of all parts makes it easy to recognize; in dry plants the color of the cap and stem becomes cinnamon or paler, and of the gills darker.

304. Pholiota discolor Pk.

N. Y. State Mus. Rep. 25, 1873.

Illustration: Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 61 B.

PILEUS 2-4 cm. broad, convex, then nearly plane, glabrous, *viscid,* hygrophanous, *rufous-cinnamon and striatulate* (moist), bright ochraceous-yellow and even (dry). GILLS adnate-subdecurrent, *narrow,* close, *whitish at first,* then ferruginous-cinnamon, edge minutely crenulate. STEM 4-8 cm. long, 3 mm. thick, equal, stuffed, *soon hollow,* sometimes compressed, pallid-fuscescent, fibrillose below. ANNULUS membranous, *persistent,* apical. SPORES elliptical, 7-9 x 5-6 micr., smooth. CYSTIDIA *few, fusiform,* slender, about 60 micr. long. ODOR none, TASTE mild.

Solitary or caespitose. On decaying wood, in mixed forests. New Richmond, Neebish Island, Ann Arbor. May-September. Frequent.

This species is probably more frequent than my observations so far indicate. The pileus is somewhat viscid, with a thin separable pellicle, and its color when dry is characteristic. *P. autumnalis* Pk. is said to differ in having a non-viscid pileus and a slight annulus; the colors are very similar. Some consider *P. autumnalis* identical with *P. marginata*. *P. discolor* sometimes forms scanty rhizomorphs on logs.

305. Pholiota unicolor (Fl. D.) Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 356.
Ricken, Blätterpilze, Pl. 56, Fig. 4.
Gillett, Champignons de France, No. 531.
Hard, Mushrooms, Fig. 213, p. 262, 1908.

PILEUS 2-4 cm. broad, convex then almost plane, obtuse, rarely umbonate, *hygrophanous,* watery-cinnamon (moist), becoming deep *ochraceous* (dry), glabrous, even, *margin extending beyond the gills.* FLESH thin, concolor. GILLS adnate and broad behind, *subtriangular* behind, often decurrent, close, *broad,* ochre-cinnamon. STEM 2-4 cm. long, 2-3 mm. thick, *stuffed,* equal, fibrillose, concolor, darker toward base, which is often white-mycelioid. ANNULUS thin, narrow, entire, persistent, membranous, apical. SPORES 8-10 x 4-5 micr., elliptical, smooth. CYSTIDIA *few,* broadly ventricose, narrowed above and obtuse, about 45 micr. long.

Subcaespitose. On decaying logs, etc., in woods. Spring and autumn. Ann Arbor. Probably rather frequent in places.

Differs from *P. marginata* by its broader gills, and persistent annulus, but it is likely that intermediate forms will be found. Harper's description of *P. marginata* applies to this plant.

306. Pholiota marginata (Batsch.) Fr. (Suspected)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 372.
Ricken, Blätterpilze, Pl. 56, Fig. 7.
Atkinson, Mushrooms, Fig. 143, p. 151, 1900.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 54 and 55.

PILEUS 2-4 cm. broad, convex then plane, watery tan (moist),

hygrophanous, *darker when dry,* glabrous, *striate on margin.* GILLS adnate, sometimes slightly subdecurrent, *narrow, crowded,* dark reddish-brown at maturity. STEM 2-8 cm. long, 3-5 mm. thick, equal, *glabrous,* stuffed then hollow, concolor, darker at base. ANNULUS distant, *fugacious.* SPORES elliptical, 7-8.5 x 4-5 micr. CYSTIDIA few or scattered, lanceolate-linear, 60-75 micr., subventricose below.

Solitary or caespitose. On decaying logs, limbs, etc., everywhere in woods. Throughout the State. Records from May 9 to November 2.

A very common little Pholiota, which appears to run into the preceding, although Fries says it is very distinct. It has appeared every month of the season in different years, but is more abundant in spring and fall. Peck has described a species under the name *P. marginella,* which he says differs from *P. marginata* by the even, fibrillose margin of the pileus, the adnexed gills and the paler, unicolorous stem. I have not seen it. *P. autumnalis* Pk. is probably the same and is said to be poisonous.

Section IV. Muscigeni. Growing on moss, wet ground or very decayed wood. Pileus hygrophanous. Cystidia absent, or in form of sterile cells on edge of gills.

307. Pholiota rugosa Pk.

N. Y. State Mus. Rep. 50, 1897.

PILEUS .5-3 cm. broad, (usually about 1 cm.), conical or campanulate, then expanded and *umbonate,* hygrophanous, striatulate on margin and rufous-ochraceous (moist), yellowish or pale ochraceous (dry), *becoming rugose-wrinkled on drying.* FLESH thin, concolor. GILLS *adnexed,* close to subdistant, not broad, slightly ventricose, *pallid ochraceous at first,* then rusty brownish, white-fimbriate on edge. STEM 3-5 cm. long, 1-3.5 mm. thick, slender, equal or slightly thickened at base, *hollow, fibrillose or scaly below the annulus,* white-mealy at apex, concolor or pallid. ANNULUS distant, membranous, *persistent,* beautifully striate on upper side, whitish beneath. CYSTIDIA none; club-shaped sterile cells on edge of gills. SPORES elliptical, 10-12 x 5-6 micr., smooth. ODOR and TASTE none.

Solitary or gregarious. On very decayed wood or on the ground in wet places. In mixed or frondose woods. Throughout the State.

Bay View, Marquette, New Richmond and Ann Arbor. August-October. Frequent.

This species is closely related and perhaps identical with either *P. togularis* Bull. or *P. blattaria* Fr. At the present time it seems impossible to determine its status with certainty. The figures of *P. togularis* by Fries and Ricken show the median annulus and the striations on its upper surface as in our species, and in most other respects they illustrate our plant well. Ricken also gives the spores of *P. togularis* as 10-12 x 5-6 micr. Other European authors give smaller spores. Fries changed his conception of *P. togularis* as expressed in Systema and Epicrisis so that in Hymen. Europ. he omits the hygrophanous character; Ricken, however, says it is hygrophanous, and both authors indicate that it is striatulate on the cap when moist. As to *P. blattaria,* Fries considered it a smaller plant, more ferruginous in color and with almost free gills. Ricken distinguishes it from *P. togularis* by the nature of the annulus which he says is striate also and at length falls to pieces. He also describes the plant as Galera-like, a comparison which Fries had made of *P. togularis.* Ricken assigns spores to *P. blattaria* measuring 7-8 x 3-4 micr., Massee gives them smaller yet, while Schroeter and Britzelmayr say they measure 9-11 x 5 micr. With such data not much can be decided. Harper has reported and described the two species, and gives the spore-sizes the reverse of those of Ricken. The markedly rugose surface of the pileus of the American plant described above as *P. rugosa* Pk., the expanded pileus, the colors and the spore size, would indicate that it had better be kept distinct at present.

Illustrations: of *P. togularis* Bull.
Fries, Icones, Pl. 104, Fig. 4.
Gillet, Champignons de France, No. 530.
Patouillard, Tab. Analyt., No. 339.
Ricken, Blätterpilze, Pl. 56, Fig. 5.
Harper, Wis. Acad. Sci. Trans., Vol. 17, Pl. 59 (as *P. blattaria*).

A variety or closely related species of the same stature and appearance as *P. rugosa* was found in low, rich woods. Its PILEUS was hygrophanous, chestnut-brown (moist), pale-alutaceous (dry), never striate nor rugulose, glabrous. GILLS rounded behind, adnate, *pallid at first* (not ochraceous), then pale brown, moderately narrow, close. STEM bulbilate, hollow, innately fibrillose-striatulate,

pallid or brownish, subfragile. ANNULUS apical, *subpersistent,* soft-floccose-fibrillose, white. SPORES 7-8 x 4 micr., smooth. It seemed intermediate between the genera Pholiota and Naucoria.

308. Pholiota mycenoides Fr.

Sys. Myc., 1821.

Illustration: Cooke, Ill., Plate 503.

"PILEUS 2-3 cm. broad, membranaceus, campanulate then convex, *everywhere striate,* hygrophanous, ferruginous-tawny or pale tan when dry. GILLS adnate, rather distant, narrow, ferruginous. STEM 3-4 cm. long, 2 mm. thick, glabrous, ferruginous, hollow. ANNULUS superior, membranaceous, white. SPORES 8-10 x 5-6 micr.

Among moss in swamps."

This species was reported by Longyear in 4th Rep. Mich. Acad. Sci. as having been found by Beardslee in Montmorency county. The description is adapted from Massee.

Cortinarius Fr.

(From the Latin, *Cortina, a curtain,* referring to the cobwebby threads which hide the gills of the young plants.)

Cinnamon-spored or rusty-brown-spored. Stem fleshy and continuous with the pileus. *When young provided with a cobwebby cortina* which connects the edge of the pileus with the stem; often also with a universal veil which on collapsing leaves an annulus, subannular rings, a sheath or shreds on the stem. Gills persistent, dry, adnate becoming emarginate, changing color during process of maturing, at length powdery with the clinging dark brown spores.

Putrescent, terrestrial, mostly forest mushrooms, composing a most natural group. The caps are often brightly colored and when young the gills of different species also assume various shades of color. The genus is divided into seven subgenera: Myxacium, Bulbopodium, Phlegmacium, Inoloma, Dermocybe, Telamonia and Hydrocybe. Of these the first three have a viscid pileus, and in this respect approach the genus Hebeloma. The latter is however, separable by its paler, alutaceus spores and fibrillose or absent cortina. The subgenera Inoloma and Dermocybe agree with the

genus Inocybe in having innately silky or scaly dry caps, but Inocybe differs in having paler spores, a more scanty, fibrillose-cortina and often with verrucose-pointed cystidia on the gills. The genus Flammula often has rusty spores, but is lignicolous. Many of the species are known to be *edible* and while no information is at hand that any of them are poisonous, the flavor of many of them is insipid or disagreeable, and others have as yet not been reported on.

The species of the genus Cortinarius are very numerous. Peck has described 83 species from North America. Fries, in his last complete work on the Hymenomycetes of Europe, records 234 species; of these he found a large majority in Sweden, where he had exceptional opportunity to study them by reason of the astonishing number of species and individuals which occur in that moist and cool climate. To quote from his Epicrisis (1836-38), "No genus is more natural nor more sharply distinguished from others. Beginners alone would confuse them with the brown-spored genera, while experienced persons can distinguish them by their habit at the first glance. But although it is a great natural group, the species are so intimately related among themselves that to distinguish the separate ones is almost to be despaired of. The large mass and number of individuals compose at least half of the Agarics of Northern forests"; and in Systema Mycologia (1821), "I did not admit even one-half the number that I had met by diligent search, and only included those that agreed in their primary characters; very many were disregarded. In the young stage and immediately after a rain, they are quite easily distinguished. After becoming discolored and in age or dry weather even the large, well-marked species are scarcely separable."

The PILEUS may be viscid, dry, silky or scaly, or hygrophanous, and these characters are used in the separation of the subgenera. The color is often very attractive: violet, purple, red, yellow, green or shades of brown, but in most cases it fades into some shade of brown or tan in age. The size varies greatly; in the subgenera Inoloma, Bulbopodium and Phlegmacium the plants are usually of large size. In Dermocybe and Hydrocybe they are rather small. Telamonia is represented by all sizes. The GILLS are, next to the cortina, the most definite means of recognizing the genus. When young they may be whitish, yellow, green or olive, blue, violet, purple, red or shades of brown. As they mature, they become discolored from the cinnamon or rusty-brown spores which cling to the surface for some time, often producing a powdery appearance. The color of the young gills must be known in order to determine a

species correctly, and in the following pages the subgenera are divided into subsections on this basis. The mature gills often show traces of the original color, especially if the spores are removed, and this makes it possible at times to determine even a fully matured plant especially when other characteristic marks are still present. The attachment of the gills varies somewhat but in nearly all species they are at length emarginate-adnate or emarginate-adnexed; a few species have the gills obscurely subdecurrent. Many species are well marked by crowded, subdistant or distant gills and frequently their width can be used to discriminate between them. The edge is scarcely ever sufficiently constant for use in diagnosis; sometimes it is very entire, sometimes much eroded or minutely serratulate, but only a few species show well developed projecting sterile cells. The trama is of the "parallel" type. The STEM is used as a means of distinguishing some of the subgenera. When it is at first covered by the glutinous veil, the plant is referable to the subgenus Myxacium. When it has a sharply defined marginate bulb, the subgenus Bulbopodium is indicated. In the larger forms of the subgenera Phlegmacium, Inoloma and Telamonia the stem is often clavate-bulbous. The veil-remnants on the stem of the subgenus Telamonia separates that hygrophanous group from Hydrocybe. Its texture is most often spongy-fleshy in the large forms, while in the smaller ones, especially of the subgenus Hydrocybe the external layer is rigid and subcartilaginous. The tissue of the stem is continuous with that of the pileus, and hence the stem is not separable from it as in Lepiota, etc.

The CORTINA is composed of loose silky hyphae, almost from the time it is discernible, and forms a "cobwebby" curtain in front of, i. e., below the gills. The threads of this curtain are inserted for some distance vertically along the stem and converge in a wedge-shaped manner toward the edge of the pileus and then coalesce with the tissue of the upper surface of the pileus. In some species it is very copious and as the pileus expands the cortina collapses on the upper portion of the stem forming a loose, fringe-like spurious ring which often becomes discolored by the falling spores. Sometimes it is more scanty and disappears early or is noticeable in the expanded plant only as a slight annular stain on the stem. In other cases, the margin of the pileus as it spreads carries with it the silky threads which remain as decorative shreds near its edge; in this case the margin is at first definitely incurved and the cortina is attached at a little distance from the incurved edge. Although the very young plant shows that the hyphae of the cortina and the

surface of the pileus are continuous, as it matures the tissue along the margin of the pileus is differentiated and becomes looser so as to appear superficial along the margin.

Lying adjacent to the cortina and continuous with it on its outer side, is a thin layer of tissue, more intimately woven together—sometimes almost membranous—which is called the *Universal Veil.* It is present in a more or less well-developed form in some of the species of all the subgenera except Hydrocybe. In Myxacium it is composed of gelatinous hyphae and when moist becomes viscid or glutinous; it envelops the young button below and becomes continuous with the gelatinous layer of the pileus. In Bulbopodium and Phlegmacium it is scarcely or not at all gelatinous but fuses above with the gelatinous and similarly colored pellicle of the pileus. In the other subgenera, when present, it leaves shreds, annular zones or a sheath on the stem and is dry and silky-woven. Further descriptions of this veil are given under the subgenera.

The SPORES are of great diagnostic value in this genus, since in the various species they differ sufficiently for use as a check to distinguish forms otherwise very similar. Some authors (Ricken, Die Blätterpilze) have attempted to separate the sections of some of the subgenera on spore-characters. The marks which are useful are size, shape and the structure of the epispore. The color, although not entirely uniform, cannot be used effectively. Their size is most important. "There is no doubt that the size of the spores of a single individual varies, and that it varies when there is every evidence that the spores are mature. But that they vary within limits which are sufficiently constant, any one can determine for himself." (Kauffman, Bull. Torr. Bot. Club., Vol. 32, p. 313, 1905.) Some species have relatively large spores, 12-15 micr. or more in length, others are small, 3-5 micr. in diam. Their shape is elliptical, often almond-shaped (i. e. inequilateral), oval or spherical. The surface is usually covered with tubercular, sometimes spiny processes, which are very marked in some species but are scarcely evident in others; under the ordinary high power objective of the microscope some appear to be quite smooth, unless very highly magnified. In using this as a specific character, one must never lose sight of the fact that when young the epispore is smooth. It is, therefore, necessary to compare the spore-sizes given in the text with spores which are mature. The BASIDIA are also quite constant in size and shape for any species, and in such species as I have measured, their size is given.

The TASTE of some species marks them clearly. In *C. vibratilis,*

C. iodioides, C. elegantoides, C. infractus and *C. ochroleucus* the surface of the pileus or of its flesh has a distinctly bitter taste; a few others are sometimes slightly bitterish. Most Cortinarii have a mild or merely fungoid taste. The European *C. damascenus* is said to have an acrid taste. The ODOR is occasionally like that of radish when the plant is crushed, e. g., *C. annulatus, C. armillatus, C. evernius, C. intrusus, etc.,* but in the majority of species no special odor is noticeable.

The HABITAT is mostly the forest floor where the rich humus soil is abundant and moist. Like many other species of Agarics they thrive best on a substratum capable of retaining moisture, i. e., a forest with either a clay subsoil, or with dense masses of humus, mosses or fallen leaves. In forests of pine, hemlock and spruce, in ravines of beech, oak and maple, where the moisture is persistent or the hillside springy, one usually finds them abundantly. Many of them have a tendency to form mycorhiza on the roots of forest trees; in Michigan I have found *C. rubipes,* and *C. elegantior* var. to be thus associated with living roots. They often occur in troops of closely aggregated individuals, sometimes in arcs, pushing up the leaves in late fall like windrows; especially is this true of some of the subgenus Bulbopodium, like *C. glaucopus* and *C. aggregatus.* Others occur in tufts of several individuals or are scattered here and there in limited areas, while not a few are found solitary, especially in dry weather. The subgenera Telomonia and Hydrocybe are much more frequent in northern conifer forests, Phlegmacium and Bulbopodium in frondose woods farther south.

The following key and text of this genus includes not only Michigan species, but all the Cortinarii of the northeastern portion of the United States which have been described or which I have seen. Since I have made a more extended study of this genus than of any other, and since Dr. Peck has not monographed this group, it seemed advisable to do this with the material now at hand. Dr. Peck's type specimens have been carefully examined, and during several week's stay in Sweden, near Stockholm, some fifty species of Cortinarii were collected and studied, most of which were recognizable as Friesian species. In addition a thorough study was made of Fries' unpublished plates,—most excellent figures in color—which are deposited in the Royal Museum at Stockholm; these plates illustrate practically all the species described by Fries in his Monograph of Cortinarius and his other works. I have, therefore, included 152 species, 90 of which I have collected in Michigan, and in the latter case the description is always made from Michi-

gan plants. Many others, doubtless definite and distinct species, have not been identified, either because of few collections or because no young stages were found. The work has been based as much as possible on the thorough foundation established for this group by Fries, with the exception that one subgenus, viz. Bulbopodium, has been segregated along lines already recognized by Fries himself. This name was proposed by Earle (N. Y. Bot. Gard. Bull., Vol. 5, p. 441) who raised the subsection *Scauri,* of Fries, to the rank of genus. For the sake of uniformity in the present report and since there is no special practical gain in breaking up such a natural genus as Cortinarius, it seemed preferable to raise the subsections of Fries only to subgeneric rank. The descriptions of the species of Peck which I have not collected are given in quotations, with such changes as adapt them to the plan of the report; in some cases additions were made from an examination of the types in order to facilitate their further study. In the key an effort has been made to avoid the use of the hygrophanous character wherever possible, so that dry weather forms may be more easily run down.

Key to the Species

(A) Pileus with a gelatinous cuticle, always more or less viscid or glutinous when moist.
(a) Stem at base with a marginate-depressed bulb. (Bulbopodium.)
(b) Pileus normally between 3 and 5 cm. broad.
(c) In green-houses, mushroom beds, etc.; gills whitish to ochraceous at first; pileus pale alutaceous. 344. *C. intrusus* Pk.
(cc) In woods.
(d) Spores 12-14 x 6-7 micr.; pileus, gills and stem violaceous. 332. *C. caerulescens* Fr.
(dd) Spores 8-9 x 5 micr.; pileus not blue.
(e) Pileus ochre-yellow to citron; gills violaceous at first; bulb shallow. 320. *C. calochrous* Fr.
(ee) Pileus olivaceous-brown; gills olivaceous at first; stem violaceous-blue. 322. *C. herpeticus* Fr.
(bb) Pileus normally between 5 and 12 cm. broad. (See also *C. herpeticus.*)
(c) In some part or wholly with violet blue or purple shades.
(d) Gills white at first, never violaceous, lower part of stem yellow. 334. *C. caesius* Clements.
(dd) Gills violaceous or purplish at first.
(e) Pileus deep purple when young.
(f) Flesh or gills changing to purple when cut or bruised.
(g) Spores spherical; pileus 8-16 cm. broad. 330. *C. sphoerosperma* sp. nov.
(gg) Spores elliptical; pileus 5-8 cm. broad.
(h) Stem solid. 327. *C. purpurascens* Fr.
(hh) Stem stuffed or hollow. 328. *C. subpurpurascens* Fr.
(ff) Flesh and gills not changing to purplish when bruised; mature pileus smoky-olive-gray and streaked; young pileus blue. 329. *C. aggregatus* sp. nov.

(ee) Pileus not purple.
(f) Whole plant pale violaceous to violaceous-white.
(g) Spores 8-10.5 micr. long; pileus and stem tinged lilaceous. 333. *C. michiganensis* Kauff.
(gg) Spores 10-12 micr. long; bulb with remains of a white universal veil. 324. *C. caesiocyaneus* Britz.
(ff) Pileus not entirely violaceous.
(g) Spores 13-16 micr. long; pileus yellow to tawny; stem violet. 319. *C. atkinsonianus* Kauff.
(gg) Spores 10-12 micr. long.
(h) Pileus dull tawny-red; stem pallid, scarcely lilac-violaceous. 331. *C. purpureophyllus* sp. nov.
(hh) Pileus violet-buff to ochraceous; stem violaceous-blue; cortina copious. 321. *C. velicopia* sp. nov.
(cc) Without violet or purplish color.
(d) Gills with green color at first. 337. *C. virentophyllus* sp. nov.
(dd) Gills not green.
(e) Pileus light red to vermillion at first.
(f) Gills caesius (bluish-gray) at first; spores 15-18 micr. long. 325. *C. rubens* sp. nov.
(ff) Gills whitish at first; spores 10-12.5 micr. long. 342. *C. sublateritius* Pk.
(ee) Pileus not red.
(f) Gills at first yellow; pileus yellow tawny, rusty or orange-fulvous.
(g) Pileus coarsely corrugate; stem long, 7-12 cm. 341. *C. corrugatus* Pk.
(gg) Pileus not corrugate; stem short, stout, with broad bulb.
(h) Taste of flesh slowly bitter; spores 15-19 micr. long. 326. *C. elegantioides* sp. nov.
(hh) Taste not bitter; spores smaller.
(i) Pileus, etc., pale sulphur-yellow. 339. *C. fulmineus* var. *sulphureus* var. nov.
(ii) Pileus tawny-yellow, orange-fulvous, etc., large.
(k) Spores 12-14 micr. long; bulb of stem scarcely depressed. 340. *C. elegantior* Fr. var.
(kk) Spores 9-12 micr. long, bulb broad, much depressed. 338. *C. fulgens* Fr.
(ff) Gills not yellow at first.
(g) Gills caesius or pallid-bluish at first; flesh of pileus at first whitish.
(h) Pileus fulvous-streaked on a steel-gray ground-color; spores 8-9 micr. long; stem at length yellowish-stained. 336. *C. glaucopus* Fr.
(hh) Pileus not streaked, pallid-alutaceous to russet-tan; spores 10-12 micr. long; stem whitish. 335. *C. aleuriosmus* Maire var.
(gg) Gills at first whitish.
(h) Pileus pale olivaceous-straw color; bulb small. 323. *C. olivaceo-stramineus* Kauff.
(hh) Pileus without any olive tint.
(i) Pileus hoary-canescent on an ochraceous-buff to rusty ground-color. Spores 7-9 micr. long. 343. *C. multiformis* Fr.
(ii) Pileus and stem white; spores 9-11 micr. long. 345. *C. albidus* Pk.

(aa) Stem equal, clavate or bulbous; bulb not marginate.
(b) Stem viscid or glutinous from the universal veil. (Myxacium.)
(c) Stem cylindrical, 6-13 cm. long; spores large, more than 10 micr. long.

(d) Stem marked by floccose, concentric interrupted rings; never violaceous. 309. *C. mucifluus* Fr.
(dd) Stem scarcely marked by thin adnate patches, or silky-fibrillose.
(e) Stem at first violaceous, lavender or lilac.
(f) Gills at first violaceous; spores 12-15 micr. long. 310. *C. cylindripes* Kauff.
(ff) Gills at first pallid or whitish; spores 15-18 micr. long, stem 5-7 cm. long. 311. *C. splendidus* Pk. 311. *C. elatior pallidifolius* Pk.
(ee) Stem white or pallid.
(f) Pileus tawny-orange; gills yellowish at first; spores 14-17 micr. long. 311. *C. muscigenus* Pk.
(ff) Pileus yellowish-brown; gills creamy-yellow at first; spores 10-12.5 micr. long. 312. *C. submarginalis* Pk.
(cc) Stem subequal to clavate, 3-7 cm. long; spores less than 10 micr. long (except *C. heliotropicus*).
(d) Taste of surface of pileus bitter.
(e) Pileus yellow; stem pure white. 314. *C. vibratilis* Fr.
(ee) Pileus lavender-violet; stem white, tinged violet in spots. 317. *C. iodeoides* sp. nov.
(dd) Taste not at all bitter.
(e) Pileus violet to purplish.
(f) Spores spherical. 316. *C. salor* Fr.
(ff) Spores elliptical.
(g) Spores 8-10 micr. long, odor not of radish. 316. *C. iodes* B. & C.
(gg) Spores 10-12.5 micr. long; odor of radish. 318. *C. heliotropicus* Pk.
(ee) Pileus not violet nor purple; spores globose.
(f) Pileus pale yellow; gills violet-tinged. 313. *C. sphoerosporus* Pk. (See also *C. berlesianus* (Pk.) Sacc.
(ff) Pileus and gills grayish to drab, stem dingy-white. 315. *C. sterilis* Kauff.
(bb) Stem not viscid (Phlegmacium).
(c) Stem annulate or spotted with brown or ochraceous scales.
(d) Pileus 5-10 cm. broad, yellow and ochraceous; stem stout, annulate. 346. *C. triumphans* Fr.
(dd) Pileus 3-6 cm. broad, bay-red; stem spotted with brown scales. 347. *C. maculipes* Pk.
(cc) Stem not spotted nor annulate.
(d) Stem very long, 10-15 cm., (8-10 mm. thick).
(e) Stem round-bulbous at base; on sphagnum; gills and stem at first tinged violet. 348. *C. sphagnophilus* Pk.
(ee) Stem not bulbous, subequal.
(f) Spores subsphoeroid; pileus yellowish-ochraceous. 357. *C. longipes* Pk.
(ff) Spores elliptical; pileus reddish-yellow. 361. *C. ophiopus* Pk.
(dd) Stem not remarkably long, 4-10 cm.
(e) Pileus corrugated, pale ochre; gills violaceous at first; stem subequal. 352. *C. copakensis* Pk.
(ee) Pileus not corrugated.
(f) Pileus reddish to tawny-orange; stem stout, clavate-bulbous; nowhere violet. 360. *C. coloratus* Pk.
(ff) Pileus not reddish.
(g) Pileus olive to smoky-brownish or brownish-ochraceous.
(h) Spores subglobose.
(i) Taste of surface of pileus bitter; plant sooty-olive. 355. *C. infractus* Fr.

(ii) Not bitter; pileus brownish-ochraceous; gills olivaceous. 358. *C. glutinosus* Pk.
(hh) Taste not bitter; spores elliptical.
(i) Gills dark olivaceous at first; stem tinged violaceous. 356. *C. olivaceus* Pk.
(ii) Gills yellow at first; stem whitish. 359. *C. luteofuscous* Pk.
(gg) Pileus grayish to buff color or yellow.
(h) Pileus virgate, becoming yellowish in age; gills violaceous at first.
(i) Stem oval-bulbous at base; at first densely fibrillose. 349. *C. lanatipes* Pk.
(ii) Stem equal; pileus dark gray. 351. *C. lapidophilus* Pk.
(hh) Pileus not virgate, pale.
(i) Stem stout, clavate-bulbous.
(k) Pileus yellow; gills at first caesius. 350. *C. claricolor* Fr.
(kk) Pileus buff; gills pale violaceous. 353. *C. albidipes* Pk.
(ii) Stem 3-7 mm. thick, equal.
(k) Spores subglobose; gills caesius at first. 354. *C. decoloratus* Fr.
(kk) Spores elliptical; gills whitish at first. 362. *C. communis* Pk.

(AA) Cuticle of pileus not composed of gelatinous hyphae, hence neither viscid nor glutinous.
(a) Pileus (and sometimes stem) distinctly scaly, usually large (except *C. flexipes*).
(b) Scales pink-red to cinnabar-red, present on cap and stem; gills whitish or pallid at first. 368. *C. bolaris* Fr.
(bb) Without red-scales on pileus.
(c) Stem marked by cinnabar-red zones; pileus tawny-rufescent; gills pale brown. 422. *C. armillatus* Fr.
(cc) Stem without red bands.
(d) Pileus, gills and stem persistently dark violet; stem long and stout; spores 12-16 micr. long; in conifer forests. 375. *C. violaceus* Fr.
(dd) Pileus not violet.
(e) Pileus some shade of yellow.
(f) Stem arising from a white mycelium; pileus and stem tawny-yellow. 369. *C. annulatus* Pk.
(ff) Stem arising from a yellow mycelium; pileus and stem saffron to chrome-yellow. 371. *C. croceocolor* Kauff.
(ee) Pileus brown, umber or chocolate-color.
(f) Stem provided above with a band-like annulus; whole plant soon chocolate-color. 366. *C. squamulosus* Pk.
(ff) Stem squarrose-scaly, brown to umber.
(g) Gills at first lilaceous or purplish; spores subglobose, 5-7 micr. 365. *C. pholideus* Fr.
(gg) Gills at first fulvous-brown; spores elliptical, 12x6 micr. 374. *C. squarrosus* Clem.
(aa) Pileus not distinctly scaly, rarely fibrillose or tomentose.
(b) Wholly or in part violet, purplish or lilaceous, at least the gills when young.
(c) Pileus normally large, 5-10 cm. broad.
(d) Gills narrow and close.
(e) Pileus, gills and stem unicolorus, pale violaceous; spores 8-10 micr. long. 377. *C. argentatus* Fr. var.
(ee) Pileus brownish-lilac; stem whitish, spores 12-15 micr. long. 381. *C. braendlei* Pk.

(dd) Gills broad, subdistant.
(e) Pileus, gills and stem unicolorous, lilaceous; stem clavate-bulbous. 376. *C. lilacinus* Pk.
(ee) Pileus and gills not unicolorous.
(f) Stem peronate or annulate from the whitish universal veil.
(g) Gills at first dull deep purple; pileus grayish-buff at first; spores 9-10.5 micr. long. 364. *C. subpulchrifolius* sp. nov.
(gg) Gills at first pallid, lilaceous or pale lavender.
(h) Pileus densely fibrillose-tomentose; gills pallid at first; stem violaceous. 412. *C. plumiger* Fr.
(hh) Pileus subglabrous.
(i) Pileus hygrophanous, purplish-umber, fading to pinkish-buff. 414. *C. umidicola* Kauff.
(ii) Pileus not hygrophanous, violaceous-fulvous to rusty-fulvous, micaceous-glistening. 391. *C. caninus* Fr.
(ff) Stem not peronate, pileus reddish-gray; gills purple. 379. *C. pulchrifolius* Pk.
(cc) Pileus medium or small in size.
(d) Pileus 3-7 cm. broad (medium).
(e) Stem distinctly peronate.
(f) Pileus and stem silvery violaceous-white; stem clavate. 363. *C. alboviolaceus* Fr.
(ff) Pileus some shade of dark purplish brown; gills smoky-purplish.
(g) Stem clavate-bulbous, stout; spores 8-11 micr. long. 411. *C. torvus* Fr.
(gg) Stem equal or subattenuate downwards; spores 7-8 micr. long. 415. *C. scutulatus* Fr.
(ee) Stem not peronate.
(f) Stem marked by reddish, subannular scales, subequal, 4-9 cm. long. 393. *C. spilomeus* Fr.
(ff) Stem not variegated with red.
(g) Stem long or much elongated, 8-18 cm. long, marked by remnants of veil.
(h) Pileus grayish-tawny, dry; stem thickened toward base; universal veil violaceous. 367. *C. erraticus* Pk.
(hh) Pileus at first violet-fuscous, hygrophanous, fading; stem intense violet at first, attenuated below; veil whitish. 413. *C. evernius* Fr.
(gg) Stem rather short, 3-7 cm. long.
(h) Stem rather stout, 7-12 mm. thick or more.
(i) Bulb of stem obliquely marginate-depressed; gills at first heliotrope or deep violet. 378. *C. obliquus* Pk.
(ii) Bulb if present not marginate; stem bulbous, clavate or tapering upward.
(k) Pileus reddish-ashy, not hygrophanous; stem with an oval bulb. 382. *C. rubrocinereus* Pk.
(kk) Pileus paler, without any reddish tinge; stem not round-bulbous.
(l) Pileus hygrophanous.
(m) Stem marked with remnants of a universal veil. 416. *C. deceptivus* Kauff.
(mm) Stem silky at first, glabrescent. 441. *C. saturninus* Fr. var.
(ll) Pileus not hygrophanous; gills and flesh at first only slightly violaceous. 392. *C. anomolus* Fr.

(hh) Stem smaller, 4-7 mm. thick.
(i) Pileus, stem and gills unicolorous, pale violaceous-drab; stem abruptly bulbillate at base. 394. *C. subtabularis* sp. nov.
(ii) Pileus not violet; gills, flesh and apex of stem violaceous at first.
(k) Pileus hygrophanous.
(l) Pileus chestnut color when moist; stem solid. 440. *C. imbutus* Fr.
(ll) Pileus sooty-brown to olive-gray; in pine woods. 442. *C. livor* Fr.
(kk) Pileus not hygrophanous.
(l) Pileus pale brownish-tan; stem solid. 383. *C. clintonianus* Pk.
(ll) Pileus dingy-white to clay-color; stem hollow, very short. 395. *C. brevissimus* Pk.
(dd) Pileus small, 1-3 cm. broad.
(e) Pileus at first conical, blackish-brown.
(f) Stem subannulate, slender; spores 6-7.5 x 3-4 micr. 419. *C. subflexipes* Pk.
(ff) Stem not annulate; spores 7-9 x 5-6 micr. 456. *C. erythrinus* Fr.
(ee) Pileus campanulate-convex, chestnut-color.
(f) Stem 4-6 mm. thick. 443. *C. castaneus* Fr.
(ff) Stem 1-2 mm. thick. 455. *C. fuscoviolaceus* Pk.
(bb) No violet, purple nor lilac colors present.
(c) Pileus large, 5-10 cm. broad.
(d) Bulb of stem oval-clavate and dark brick-red; pileus hygrophanous, rufous-brown. 421. *C. rubripes* Kauff.
(dd) Stem not red.
(e) Pileus with a rufous tinge either when fresh or on drying.
(f) Pileus hygrophanous, very glabrous, stem pallid-whitish, subclavate. 444. *C. armeniacus* Fr. 448. *C. glabrellus* Kauff.
(ff) Pileus dry, reddish to brownish-orange, stem yellow or concolor, long and equal. 387. *C. whitei* Pk.
(ee) Pileus without reddish tinge.
(f) Pileus creamy-yellow, yellow, ochraceous, orange-yellow or rusty-yellow.
(g) Stem peronate by a close-appressed sheath.
(h) Sheath pale tawny-yellowish; pileus tawny-yellow, often scaly on disk. 369. *C. annulatus* Pk.
(hh) Sheath whitish; pileus pale.
(i) Pileus creamy-buff, large; spores subglobose. 370. *C. flavifolius* Pk.
(ii) Pileus pale ochraceous; spores elliptical. 372. *C. ochraceus* Pk.
(gg) Stem not sheathed.
(h) Pileus hygrophanous, dark ochraceous; stem almost equal, subannulate. 423. *C. morrisii* Pk.
(hh) Pileus not hygrophanous.
(i) Pileus pale yellow to buff; stem white, caespitose. 388. *C. caespitosus* Pk.
(ii) Pileus and stem chrome-yellow to rusty-yellow.
(k) Pileus streaked with rusty fibrils; stem with an oval bulb. 385. *C. autumnalis* Pk.
(kk) Pileus not streaked; stem clavate, streaked lengthwise. 384. *C. callisteus* Fr.
(ff) Pileus neither reddish nor yellow.
(g) Stem white or whitish.
(h) Pileus hygrophanous, brown when moist.

(i) Pileus conic-campanulate; stem clavate; silky-fibrillose. 446. *C.* sp.
(ii) Pileus convex-plane; stem tapering down, glabrous. 445. *C. duracinus* Fr. var.
(hh) Pileus not hygrophanous, pale gray; stem clavate-bulbous.
(i) Stem peronate by a white sheath. 373. *C. canescens* Pk.
(ii) Stem not peronate.
(k) Spores 7-8 micr. long; gills watery-cinnamon at first. 386. *C. catskillensis* Pk.
(kk) Spores 10-12 micr. long; gills at first pallid. 418. *C. griseus* Pk.
(gg) Stem brown or fuscescent.
(h) Stem annulate by a white band; spores 10-12 micr. long. 432. *C. brunneofulvus* Fr.
(hh) Stem annulate at times by a fuscous zone; spores 8-9 micr. long. 433. *C. brunneus* Fr.
(cc) Pileus medium size or small, between 1 and 5 cm.
(d) Stem not very slender, more than 3 mm. thick, sometimes clavate-bulbous at first.
(e) Gills blood-red or cinnabar-red; stem equal, not stout.
(f) Pileus and stem tawny-yellow to cinnamon-yellow. 408. *C. semisanguineus* Fr.
(ff) Pileus and stem blood-red to cinnabar.
(g) Pileus rather broader than the length of the stem; spores 8-9 x 5-5.5 micr., in oak woods. 409. *C. cinnabarinus* Fr.
(gg) Pileus narrow, stem longer; spores 6-7 x 4 micr.; on moss, conifer regions. 409b. *C. sanguineus* Fr.
(ee) Gills not red.
(f) Stem clavate, subclavate or at least tapering upward, often clavate-bulbous at first.
(g) Pileus hygrophanous.
(h) Pileus conic-campanulate at first; on mosses.
(i) Spores 10-12 x 6 micr.; stem long, cylindrical, pallid to fuscescent. 390. *C. gracilis* Pk.
(ii) Spores 7-8.5 x 5-6 micr.; stem subzonate from the veil; wholly fawn-brownish. 424. *C. mammosus* sp. nov.
(hh) Pileus not conic.
(i) Stem distinctly fuscescent, solid, pileus dark fuscous-brown. 451. *C. rubricosus* Fr. var.
(ii) Stem not becoming dark fuscous.
(k) Pileus white-hoary at first on a chestnut-bay-brown ground color. 450. *C. subrigens* sp. nov.
(kk) Not markedly white-hoary at first.
(l) Pileus grayish-umber, with rufous tinge when moist. 447. *C. erugatus* Fr.
(ll) Pileus fuscous-brown, never rufous. 449. *C. privignus* Fr. var.
(gg) Pileus not hygrophanous.
(h) Gills cadmium-yellow; narrow; pileus and stem olivaceous-cinnamon. 402. *C. cinnamomeus* Fr. var.
(hh) Gills pallid or whitish at first.
(i) Pileus whitish, tinged pale yellowish; stem variegated with pallid-yellowish scales. 396 *C. albidifolius* Pk.
(ii) Pileus alutaceous; stem subfibrillose, concolor. 389. *C. modestus* Pk.

(ff) Stem equal, attenuated below or subventricose; not definitely thickened at the base.
(g) Pileus watery-brown, bay-brown or chestnut color when moist.
(h) Gills distant or subdistant, brownish at first.
(i) Stem rather stout, 5-12 mm. thick.
(k) Stem normally annulate by a white zone; gills distant. 434. *C. distans* Pk.
(kk) Stem not annulate.
(l) Stem subequal, gills brown, close to subdistant. 452. *C. uraceus* Fr.
(ll) Stem equal; gills purplish-brown, distant. 417. *C. adustus* Pk.
(ii) Stem 3-5 mm. thick, pallid at first. 453. *C. juberinus* Fr. var.
(hh) Gills close or crowded.
(i) Stem with remnants of the veil; gills brownish-ochre at first; spores 7 x 3.5 micr. 435. *C. nigrellus* Pk.
(ii) Stem subsilky; gills reddish-umber at first; spores 7-10 x 6.5 micr. 454. *C. praepallens* Pk.
(gg) Pileus not dark brown.
(h) Flesh olivaceous to green.
(i) Pileus and stem fulvous to tawny-fulvous. 407. *C. malicorius* Fr.
(ii) Pileus and stem light olive. 410. *C. raphanoides* Fr.
(hh) Flesh not olivaceous-green.
(i) Stem stout, 8-12 mm. thick.
(k) Pileus, gills and stem yellow; spores subglobose. 404. *C. luteus* Pk.
(kk) Pileus, gills and stem white or whitish, taste bitterish. 397. *C. ochroleucus* Fr.
(ii) Stem 3-6 mm. thick.
(k) Stem peronate by a yellow sheath; gills saffron-yellow; pileus rusty color when moist. 425. *C. paludosus* Pk.
(kk) Stem not peronate.
(l) Stem with white annular zone; pileus yellowish, fragile. 426. *C. hinnuleus* Fr. var.
(ll) Stem not annulate.
(m) Pileus hairy, tawny; stem short, pallid to pale tawny. 400. *C. basalis* Pk.
(mm) Pileus silky to appressed tomentulose; gills yellow.
(n) Stem rather long, 4-10 cm.
(o) Pileus obtusely conic-campanulate, rufous-fulvous; with stem streaked with rufous-fulvous fibrils. 403. *C. croceoconus* Fr.
(oo) Pileus campanulate-convex, yellowish-cinnamon, tawny, etc., stem chrome-yellow. 401. *C. cinnamomeus* Fr.
(nn) Stem short, 2-4 cm. long.
(o) Spores 10-12.5 micr. long; pileus cinnamon-brown; odor of radish. 405. *C. aureifolius* Pk.
(oo) Spores 6-7 micr. long; pileus cinnamon; gills saffron-yellow to orange. 406. *C. croceofolius* Pk.

(dd) Stem slender, 1-3.5 mm. thick.
(e) Pileus conical, then campanulate.
(f) Pileus fibrillose-hairy, fuscous to umber.
(g) Stem slender, with delicate white zones, fuscescent.
(h) Spores 10-12 x 5-6.5 micr. 429. *C. iliopodius* Fr.
(hh) Spores 6-8 x 4-5 micr. 439. *C. paleaceus* Fr.
(gg) Stem short annulate by single median whitish zone, fuscescent. 431. *C. impolitus* sp. nov.
(ff) Pileus glabrous, or soon glabrous.
(g) Pileus not hygrophanous, chestnut color; spores large, 15-16 micr. long. 398. *C. sericipes* Pk.
(gg) Pileus hygrophanous, watery-brown, fulvous or chestnut color at first.
(h) Stem attenuated-subrooting, soon rigid, whitish and shining when dry. 459. *C. scandens* Fr.
(hh) Stem equal.
(i) Stem "rubello"-tinged or yellowish at first.
(k) Stem pallid or rufous-tinged; pileus even, with blackish umbo. 457.. *C. decipiens* Fr.
(kk) Stem yellowish at first; pileus striate when moist. 462. *C. acutus* Fr.
(ii) Stem not yellowish.
(k) Growing on decayed wood, gills broad; stem cingulate. 460. *C. lignarius* Pk.
(kk) Not on decayed wood.
(l) Gills narrow; pileus pale chestnut color when moist, spores 8-10 micr. long. 461. *C. acutoides* Pk.
(ll) Gills rather broad; pileus watery-cinnamon when moist; spores 7-8 micr. long. 458. *C. leucopus* Fr. var.
(ee) Pileus campanulate-convex to plane.
(f) Pileus canescent with superficial fibrils. 438. *C. hemitrichus* Fr.
(ff) Pileus glabrous, chestnut-brown when moist.
(g) Pileus not hygrophanous, umbo blackish. 399. *C. castanellus* Pk.
(gg) Pileus hygrophanous.
(h) Spores 10-12 micr. long; stem 2-4 cm. long; gills at first yellowish, cream color or whitish. 428. *C. badius* Pk.
(hh) Spores 6-7.5 micr. long.
(i) Gills rufous-cinnamon; stem fuscescent, with whitish median annulus. 436. *C. rigidus* Fr.
(ii) Gills yellowish or yellowish-cinnamon; stem pallid, spotted by subannular, white zones. 427. *C. castaneoides* Pk.

SUBGENUS MYXACIUM: Provided with a glutinous or *viscid* universal veil; pileus and stem becoming polished by the drying of the gluten.

This group corresponds to the subgenus Limacium of the genus Hygrophours. The entire plant when young is covered by a differentiated gelatinous layer which becomes glutinous in moist weather, and which breaks up on the stem so as to leave shreds, patches or rings of various degrees of definiteness. In some species the glutinous remnants on the stem are very thin and subevanescent and not

easily made out; in others, e. g. *C. mucifluus,* the thick layer of the universal veil is cracked and torn crosswise, and the resultant bands or rings are rather marked and persistant, while in still other cases the stem is peronately but very thinly sheathed. Because of their great variability, especially in color, which varies with habitat, weather, age, etc., the species of this group have as yet uncertain limits and are differently interpreted by different authors.

309. Cortinarius mucifluus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 148, Fig. 1.
Cooke, Ill., Pl. 740 (fresh condition).
Cooke, Ill., Pl. 738 (older stage, as *C. collinitus*).
Gillet, Champignons de France, No. 206 (as *C. collinitus*).
Ricken, Die Blätterpilze, Pl. 34, Fig. 1 (as *C. collinitus*).
Michael, Führer f. Pilzfreunde, Vol. III, No. 85 (as *C. collinitus*).
N. Y. State Mus. Rep. 48, Pl. 13, Fig. 1-6 (as *C. collinitus*).
Plate LXIII of this Report.

PILEUS 3-8 cm. broad, at the very first subglobose, then campanulate-convex and margin incurved, finally campanulate-expanded to plane, obtuse, *glutinous when moist,* the gluten derived from the very thick gelatinous pellicle varying in color from whitish when young to *straw-yellow, orange-yellow or tawny-fulvous,* sometimes stained with rusty or sulphur hues, shining when dry. FLESH pallid or stained in age with yellow or rust color. GILLS *at first pallid or grayish-white* (*caesious*), then clay color to rusty-cinnamon, adnate to subemarginate, medium broad, close. STEM 6-12 cm. long, 7-12 mm. thick, *cylindrical or tapering downward,* rather stout from the first, rigid, spongy-stuffed, at the very first whitish and covered by the thick gelatinous layer of a *universal veil,* which cracks transversely, *forming scaly, thick, sometimes squarrose bands of dried gluten,* especially below, soon becoming discolored and then yellowish, rusty or tawny, terminating above with the discolored cortina in the form of a collapsed ring. SPORES 10-13 x 6-7 micr. (rarely up to 14.5 micr. long), almond-shaped, tuberculate, inequilateral-elliptic, rusty-cinnamon in mass. BASIDIA 4-spored, 36-42 x 9-10 micr. ODOR and TASTE not marked.

Gregarious. In low, rich ground of coniferous or frondose woods,

copses, swamps, etc., among mosses or on humus, or rich loam. Throughout the State. August-October. Frequent.

This species is distinguished from all others by its peculiar transversely-banded stem, although often only the lower portion shows this character distinctly. The white *cortina* extends down the stem inside the gelatinous layer as a soft, floccose layer, and when the outer glutinous layer breaks across on drying, the floccose, cortinate layer is exposed and gives the floccose effect to the bands. The young plants often arise deep in the humus, and the stout stem at this time has almost the diameter of the young cap. The gluten on the upper half of the stem, often of most of the part above the substratum, is inclined to dry or dissolve, so that the diffracted-scaly character is found only in the lower protected part. In the young stage the arrangement of the two veils can be easily made out. It is edible but should be peeled before cooking.

This is *Cortinarius collinitus* Fr. of all authors, except of Fries himself. Of this I satisfied myself by an examination of the plates of Fries which are deposited in the Royal Museum at Stockholm, Sweden, and by collections around Upsala and Stockholm. In the persistently moist climate of that region, the thick rings on the stem develop much more perfectly than with us, and this is well shown by Fries in the published plate in Icones referred to above. Furthermore, there exists in the same collection an unpublished plate by Fries, marked *C. collinitus* Fr., illustrating, in all its stages, a plant frequent in conifer forests around Stockholm. This is very similar to *C. cylindripes* Kauff., differing only in having larger spores. Fries, himself, has brought about the confusion, in his description of the two species. For example, the description accompanying Plate 148, Fig. 1, in Icones, does not apply to those figures, nor does his description of *C. collinitus* in any of his works, apply to the figures of the unpublished plate at Stockholm. Starting with his description of *C. collinitus* in "Systema," where he says the gills are "purpurascens" or "violascens," he gradually changes it in his later works, and in Hymen. Europ. describes them as at first "argillaceous" or "caesious." In Systema the scales are said to be "appressed" to the stem, and his whole diagnosis in the Systema might be interpreted—although somewhat forced—to refer to his unpublished plate. In view of these facts, I have ventured to correct what appears to have become an established error. In the case of the descriptions the matter remains debatable, but there can be no doubt about the plates.

This is a very variable species, and a number of ecological forms

might be separated. Ricken has discovered two forms with different spore sizes, one which he calls the type has spores 13-15 x 7-8 micr.; the other, which he calls var. *repanda* has spores 11-13 x 6-7 micr. All collections examined by me, including two of Peck's and several from Ithaca, N. Y., yielded the spore-size given in my description. Two of Peck's collections, from Sand Lake and Catskill Mountains referred to in his 23rd Report, when examined had spores measuring 15-19 x 7-8.5 micr., and in other respects showed that they did not belong here, but are probably close to *C. muscigenus* Pk.

310. Cortinarius cylindripes Kauff.

Bull. Torr. Bot. Club, Vol. 32, p. 321, 1905.

Illustrations: Ibid, Fig. 2, p. 306.
Jour. of Mycology, Vol. 13, p. 36, Pl. 98, 1907.
Mycological Bull., Vol. V, Fig. 244, p. 318, 1907.
Plate LXIV of this Report.

PILEUS 3-7 cm. broad, *very glutinous at first* and shining, later opaque, at the very first lavender, then yellowish with a violaceous tinge, at length brownish-ochraceous, somewhat stained by these colors at various stages, obtusely orbicular when young, then campanulate and expanded, rather small in comparison with the length of the stem, margin incurved and pellucid-striate, surface smooth, *at length longitudinally wrinkled.* FLESH thick on disk, thin elsewhere, *violaceous,* soon sordid-white. GILLS rather broad, at length 5-8 mm., adnate, emarginate, not attenuate in front, *violaceous or lavender* when *young,* becoming pale cinnamon, not crowded, thin, edge serratulate-flocculose and paler, somewhat wrinkled at the sides but not veined. STEM 8-10 cm. long, 5-9 mm. thick, elastic, *remarkably equal, covered by a violaceous, glutinous, universal veil,* which remains as evanescent, adnate patches and at its junction with the partial veil as a slight annulus, smooth or fibrillose-striate at the apex, violaceous to dingy white within, solid stuffed. SPORES *almond-shaped,* rough-tuberculate, inequilateral-elliptic, 12-15 x 6.5-8 micr., dark brown. BASIDIA 40-45 x 10-13 micr., 4-spored, with sterigmata, 5-7 micr. long. ODOR and TASTE not specific.

Gregarious or subcaespitose. On low, rich ground or humus, conifer and frondose woods. Throughout the State. From late July to early October. Frequent.

C. cylindripes usually occurs in considerable numbers where found. Its cylindrical stem is at first a beautiful pale azure-blue, due to the thin universal veil, which fades and leaves whitish thin patches which sometimes disappear. The species corresponds to Fries' species, figured in his unpublished plates at Stockholm and named *C. collinitus.* (See notes under *C. mucifluus.*) Specimens of that species collected in Sweden are in my herbarium and have spores measuring 14-18 micr. long, much larger than in the American form. I consider that species, common around Stockholm, as Fries' original *C. collinitus.* Our species, described above, has violaceous or blue tints just like that one, and as Fries has described no other species to which the Stockholm plants could be referred, the indication is strong that he considered them *C. collinitus.* For the present the difference in the spore size will be sufficient to keep *C. cylindripes* distinct. The violaceous gills, etc., distinguish *C. cylindripes* from both Fries' and Ricken's conception of *C. mucosus,* and from the related species of Peck: *C. muscigenus* Pk., *C. splendidus* Pk., and *C. elatior pallidifolius* Pk.

311. Cortinarius muscigenus Pk.

N. Y. State Mus. Rep. 41, 1888.

"PILEUS 3-6 cm. broad, at first ovate, then convex, or concave from the recurving of the margin, subumbonate, glabrous, *viscose with a separable pellicle, tawny-orange* and widely striate on the margin when moist, tawny and shining when dry. FLESH dingy white, tinged with yellow. GILLS broad, ventricose, adnate, with a broad, shallow emargination, somewhat rugose on the sides, *yellowish,* becoming cinnamon. STEM 7-10 cm. long, 6-8 mm. thick, elongated, subequal, *viscid,* even, silky, solid, *white or whitish.*" SPORES almond-shaped, rough-tuberculate, 14-17 x 7-9 micr. (rarely up to 18.5 micr. long).

"Mossy ground under balsam trees. Wittenberg Mountains, New York. September."

This species appears to have the stature of *C. cylindripes,* but has larger spores and lacks the violaceous color entirely. The spores of the type specimens are larger than given by Peck in the original description. The color of the pileus is similar to that of *C. mucifluus* Fr.

Cortinarius splendidus Pk. (N. Y. State Mus. Rep. 29, 1878), differs from *C. muscigenus* in smaller size and *violaceous stem.* Its

spores are similar, 15-18 x 6-8 micr., larger than given by Peck. The dried type specimens indicate that they are closely allied, and that one is a variety of the other.

Cortinarius clatior pallidifolius Pk. is also probably a variety of *C. muscigenus* Pk. The spores are the same, 15-17.5 x 7.5-9 micr., but the *stem is tinged with lilac.* Both varieties have a shorter stem than *C. muscigenus,* and the caps are said to be pale fuscous, although in the dried specimens they have the same shining, tawny-tan color as in that species. The last variety is described and figured in N. Y. Mus. Rep. 54, 1901.

312. Cortinarius submarginalis Pk.

N. Y. State Mus. Bull. 54, 1902.

Illustrations: Ibid, Plate L, Fig. 6-10.

"PILEUS 5-10 cm. broad, firm, convex becoming nearly plane, concave by the elevation of the margin, viscid when moist, *yellowish-brown,* generally *a little paler on the rather definite and commonly fibrillose margin.* FLESH whitish. GILLS thin, close, rather broad, adnate, creamy-yellow when young, soon cinnamon. STEM 7-15 cm. long, 8-12 mm. thick, elongated, equal or slightly thickened at the base, solid, silky-fibrillose, *slightly viscid,* whitish or pallid." SPORES almond-shaped, slightly rough, 10-12.5 x 5-6 micr.

"Low moist places in Woods. Bolton, New York. August. The margin is separated from the rest by a definite line, is 6-12 mm. broad and conspicuously fibrillose." The description is adopted from that of Peck.

313. Cortinarius sphærosporus Pk.

N. Y. State Mus. Rep. 26, 1874.

Illustration: Plate LXV of this Report.

PILEUS 3-7 cm. broad, hemispherical-convex then expanded-plane, glabrous, even, *with a thick gelatinous straw-yellow pellicle,* which is glutinous when moist. FLESH thin on margin, *violaceous at first,* soon pallid. GILLS *violaceous at the very first, soon whitish* then cinnamon, adnate-subemarginate, close, rather broad. STEM 5-10 cm. long, 5-8 mm. thick, subclavate or tapering upward, equal above, spongy-stuffed, *glutinous when moist from the thin universal veil, which on drying leaves thin yellowish patches on the lower*

portion, apex at first pale violaceous, soon white. SPORES oval-subglobose, slightly rough-punctate, 6-7.5 x 5.5-6.5 micr.

In low, moist woods or swamps. August-September. Coniferous regions. Infrequent.

This species corresponds closely with the European *C. delibutus* Fr. which also has subglobose spores. In the American plant the spores are constantly a little smaller, as shown by two collections from Sweden. In that species the spores measure 7-8.5 x 6-7 micr. Britzelmayr reports under the name *C. delibutus,* a species with spores 14-16 x 6 micr. Such a plant, with all other characters similar to *C. delibutus* Fr., has been collected by me, but not sufficient data are at hand to describe it. It is possible that *C. berlesianus* (Pk.) Sacc. of which the spores of the type specimens measure 7-8 x 6-6.5 micr., is a form of the European *C. delibutus* Fr., but its stem has a rounded bulb.

314. Cortinarius vibratilis Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Plate 744.
Gillet, Champignons de France, No. 256.
Ricken, Blätterpilze, Pl. 35, Fig. 2.

PILEUS 2-5 cm. broad, *surface bitter to the taste,* convex, obtuse, gibbous, *with a glutinous pellicle,* hygrophanous, *yellow, ochre-yellow to fulvous-yellow,* paler when dry, glabrous, even. FLESH soft, thin except disk, white or whitish, *bitter.* GILLS *adnate to slightly subdecurrent* or subemarginate, thin, close, rather narrow, *pallid to pale ochraceous,* then pale ochraceous-cinnamon. STEM 3-7 cm. long, variable in length, 4-10 mm. thick, subclavate or tapering either way, *soft, pure white, clothed when young by a glutinous, hyaline, universal veil* which soon dries, often viscid only at base, soft-stuffed. SPORES narrowly elliptical, almost smooth, 6-7.5 x 4-5 micr. BASIDIA 26-28 x 7 micr., 4-spored. ODOR mild or subaromatic. TASTE of *every part intensely bitter.* CORTINA white.

In conifer and frondose woods, among leaves or humus. Throughout the State. August-September. Infrequent.

The American plant, named *C. amarus* by Peck, does not differ from *C. vibratilis* Fr. as it occurs around Stockholm. The spores, bitter taste of all parts and the hyaline gluten of the universal veil are the same. *C. amarus* Pk. was originally referred to the subgenus Phlegmacium (N. Y. State Mus. Rep. 32, p. 30, 1879) but

later, Dr. Peck referred it to its proper position. *C. vibratilis* is distinguished by its pure white stem, pallid gills and yellow cap; the last may take on fulvous or rufous brown hues on the disk. An occasional individual of larger dimensions occurs. The stem varies in length and shape, and in mossy wet places often becomes more elongated. The gluten often drips from the edge of the cap in moist weather and on drying the cap becomes shining. This species might be confused with *C. causticum* Fr., unreported in Michigan, in which only the viscid pellicle of the pileus is bitter. Two other European species, *C. emollitus* Fr. and *C. crystallinus* Fr. possess bitter flesh and somewhat similar colored caps, but they belong to the subgenus Phlegmacium and their stems are not pure white.

315. Cortinarius sterilis Kauff.

Torr. Bot. Club Bull., Vol. 32, 1905.

Illustrations: Ibid, Fig. 1, p. 304.
Jour. of Mycol., Vol. 13, Pl. 96, p. 36, 1907.
Mycol. Bull., Vol. 5, Fig. 242, p. 316, 1907.

PILEUS 1.5-4.5 cm. broad, suborbicular when young then convex-expanded, margin incurved, drab, *drab-gray to olive buff,* even, smooth, *viscid,* somewhat umbonate at times. FLESH white, soft, thin. GILLS relatively broad, 4-6 mm., drab-gray at first, then light-cinnamon, rounded behind, then emarginate, not at all ventricose, rather crowded, edge serratulate and white, later eroded, *provided with sterile cells.* STEM 4-8 cm. long, 4-6 mm. thick, at base up to 10 mm., clavate or tapering upward, solid, spongy, or tapering upward, dingy-white, tinged with light blue toward apex, clothed when fresh with the delicate patches of the *viscid,* universal veil, which is of the same color as the pileus, within pale bluish at apex, white below. SPORES subsphoeroid, almost smooth, 6-7 x 5-6.5 micr. CORTINA white or sordid.

Gregarious in swamps of cedar, etc. Bay View. August-September. Rare.

The spores and the peculiar color of cap and veil distinguish this species. It has been found only twice, in low, wet, sphagnous or mossy swamps. Its name refers to the sterile cells on the edge of the gills.

316. Cortinarius iodes B. & C.

PILEUS 2-6 cm. broad, campanulate-convex, glabrous, even, *with a tough, viscid, separable pellicle, dark violet to purplish,* at length often yellowish on the disk. FLESH thick on the disk, abruptly thin on the margin, violaceous then paler. GILLS adnate, close, moderately broad, *violaceous at first,* then gray-cinnamon. STEM 5-7 cm. long, equal or clavate-thickened or tapering to either end, 4-8 or 5-15 mm. thick, *viscid,* solid, subfibrillose. CORTINA pale violaceous. SPORES broadly-elliptical, minutely rough-punctate, 8-10 x 6-6.5 micr. TASTE *mild.* ODOR none.

Gregarious or subcaespitose. On the ground in low, wet places in woods. August. Detroit. Infrequent.

This is very similar in color and stature to *C. iodeoides* but lacks the bitter taste of the pellicle of the cap. The color is deeper and the spores are larger than in that species. It appears to be related to the European *C. salor* Fr. which has similar colors but whose spores are truly spherical. It has been received from the eastern part of the United States where it occurs more frequently.

317. Cortinarius iodeoides sp. nov.

Illustration: Plate LXVI of this Report.

PILEUS 2-5 cm. broad, convex then expanded, broadly umbonate to plane, *deep lavender-violet or bluish-violet when young or fresh,* fading to livid-ashy, sometimes faintly yellowish or buff-spotted, *with a bitter pellicle which is glutinous* when moist or young, glabrous, even. FLESH at first pale violaceous, soon white, thin on margin, thickish on disk. GILLS adnate then emarginate, rather narrow, close, pale violaceous, *soon whitish,* at length pale ochraceous-cinnamon. STEM 2-6.5 cm. long, clavate-thickened at base or variously thickened or subcompressed, 4-8 mm. thick, white but *covered when young by the thin, delicately violaceous, glutinous, universal veil,* stuffed, silky or glabrous. SPORES elliptical, almost smooth, 7-7.5 x 4-4.5 micr., pale ferruginous-cinnamon in mass. ODOR none or slight. TASTE of flesh mild, *of pellicle of pileus bitter.*

Subcaespitose or gregarious. Among leaf-mold, often hidden by leaves, in frondose woods of maple, oak, etc. August-October. Ann Arbor, New Richmond. More frequent than the preceding.

This species is easily confused with the preceding, but is clearly distinct because of the bitter surface of the cap which is quickly

recognized, and the different spores. A more careful comparison shows slight differences in the colors. It is often hidden by the leaves, especially in the late fall.

318. Cortinarius heliotropicus Pk.

N. Y. State Mus. Bull. 94, 1905.

Illustration: Ibid, Pl. P., Fig. 1-7.

"PILEUS 2.5-6.5 cm. broad, broadly campanulate, convex or nearly plane, fibrillose, *viscid, heliotrope-purple, generally spotted or variegated by yellowish-white spots.* FLESH whitish, thin. GILLS narrow, thin, close, rounded behind, adnexed, *concolorus with the pileus when young,* cinnamon when mature. STEM 3.5-7 cm. long, 4-8 mm. thick, *firm,* solid or spongy within, usually slightly thickened at base, silky-fibrillose, *viscid, whitish and spotted with purple or colored like the pileus,* white within. SPORES 10-12.5 x 5-6 micr., elliptic. TASTE mild or slightly acrid. ODOR slightly of radish.

"In woods. Smithtown, New York. August.

"This is one of the most beautiful species of Cortinarius. In some specimens the spots on the pileus are large or confluent, in others they are almost or entirely absent, but usually they are small and distinct. The purple color of the gills is persistent for some time. In large specimens the margin is sometimes adorned by fibrillose scales of the veil."

This and the two preceding are all of medium size and beautifully colored. The description and notes are adopted from Peck. This species seems to differ from *C. iodes* mainly in the larger spores and perhaps in taste and color.

SUBGENUS BULBOPODIUM: Stem dry, *at first hidden,* then usually stout, with a thick, abrupt, marginate-depressed bulb, to whose margin is attached the cortina; the universal veil is either manifest or lacking in the young stage. Pileus with a *viscid* pellicle; equally fleshy.

This is the section "Scauri" of Fries. The structure of the bulb and the development of the stem is unique among the Cortinarii, and the group deserves equal rank with the other subgenera. The "button" stage of the young plant consists only of pileus and bulb, the former smaller than and closely pressing on the bulb. The rest of the stem is invisible, since its beginnings are enclosed

undeveloped under the pileus. The margin of the pileus rests on the broad bulb and produces the typical, abruptly depressed edge of that body. The cortina extends from the margin of the pileus to the bulb, to whose upper surface it is attached and, during development, is carried up on the lower part of the elongating stem. The universal veil when present envelops the bulb and extends to the surface of the pileus in the form of a thin, slightly woven membrane, which breaks away in a circumscissile manner from the margin of the pileus at an early stage and is only noticeable, after the expansion of the plant, on the exterior of the bulb or where the torn fringes of its upper portion extend above the margin of the bulb and lie against the stem; it is usually of the same color as the surface of the pileus and this shows on the bulb and on the stem immediately above it. Sometimes this veil is slightly gelatinous. Species occur which are intermediate between this and the following subgenus, where the bulb is scarcely depressed or marginate, or where the margin of the pileus almost covers the slight bulb so that the latter is margined only about its base. The stem is never peronate nor annulate by the universal veil in this subgenus. The connection of the margin of the bulb with the cap and the circumscissile manner in which the universal veil breaks across are somewhat similar to the conditions in some Amanitas.

The species of this group are numerous, and many more will probably be found in Michigan. Fries appears to apologize for including and naming so many species under the section Scauri, as witness his remarks under that section in Epicrisis: "An astonishing number of closely related forms, which, although they were all constant, I was ashamed to separate in Sys. Myc., but published them under titles which were much broader. But I am compelled to recognize them lest the limits appear to be arbitrary, since their existence in nature has been verified many times." Not a few others have already been found in the State, but their identity is not yet established.

Section I. Universal veil present.

**Gills, flesh or stem at first violaceous, bluish, or purplish, rarely olivaceous or white.*

319. Cortinarius atkinsonianus Kauff. (Edible)

Bull. Torr. Bot. Club, Vol. 32, p. 324, 1905.

Illustrations: Ibid, Fig. 6, p. 316.
Jour. of Mycol., Vol. 13, Plate 99, p. 36, 1907.
Plate LXVII of this Report.

PILEUS 6-9 cm. broad, convex then expanded, *wax-yellow or flavus at first,* tinted with olivaceous, then alutaceous or reddish-tawny in places, with a *viscid separable pellicle,* glabrous, even. FLESH thick, rather soft, *at first deep violet* or lavender, slowly fading. GILLS adnate becoming slightly sinuate, rather narrow, width uniform, *deep violet or purplish at first,* edge sometimes olivaceous-yellowish, at length cinnamon. STEM 6-8 cm. long, stout, 12-18 mm. thick, *deep violet or violaceous blue,* concolor within, solid, dry, equal or tapering upward from a rather thick, marginate, broadly turbinate *bulb* up to 3 cm. thick, and externally clothed by the *olivaceous-yellow universal veil,* apex of stem fibrillose, elsewhere hung with the fibrillose remains of the *olivaceous-yellow cortina.* SPORES almond-shaped, elliptical, *very tuberculate,* 13-15 (rarely 16) x 7-8.5 micr., rusty-cinnamon in mass.

Gregarious. In leaf-mould or among fallen leaves, in rich, mixed or frondose woods. Ann Arbor, Detroit, New Richmond. September-October. Infrequent.

This noble species is the prince of known American Cortinarii. Several collections in all stages of development have made it possible to emend the original description and refer it to its proper place in the genus. The colors of the fresh plants are vivid and most beautiful. The flesh is at first intense violet, and by peeling the pileus this color is at once exposed under the yellow pellicle. There is an olivaceous tinge in the yellow color of the pileus, cortina and universal veil in the young plant, and the edge of the gills may also be laved with the olivaceous-yellow coloring. The taste and odor are mild. It seems closely related to *C. arquatus* Fr. in the sense of Ricken, from which it differs mainly in its intensely violet or purplish flesh. The figure of Ricken (Blätterpilze, Pl. 36, Fig. 4) how-

ever, gives a very inadequate conception of our plant. It is barely possible that this is the American form of that species.

320. Cortinarius calochrous Fr.

Syst. Myc., 1821 (segregated, Epicrisis, 1836-8).

Illustrations: Gillet, Champignons de France, No. 200.
Plate LXVIII of this Report.

PILEUS 3-6 cm. broad, *not large,* convex, soon expanded-plane, *bright ochre-yellow to citron-yellow,* fulvous on disk, *with a viscid pellicle,* glabrous, even. FLESH thickish, rather compact, whitish. GILLS emarginate-adnexed, crowded, thin, rather narrow, *rosy-violet to violaceous-purple at first,* at length pale clay-cinnamon, *edge serratulate.* STEM 3-5 cm. long, 5-9 mm. thick, solid, pale violaceous or whitish at first, soon becoming dingy yellowish, equal above the *rather small, abrupt, marginate-depressed, shallow bulb,* which is clothed at first by the *yellow universal veil.* SPORES sub-inequilateral, elliptical, 8-9 (rarely 10) x 4-5.5 micr., cinnamon in mass. BASIDIA 28-30 x 7-8 micr., 4-spored. ODOR and TASTE mild.

Solitary or scattered. In low, rich woods of maple, beech, etc. Ann Arbor. September-October. Infrequent.

A medium-sized plant, never becoming large. Known by its peculiar bulb which, in the typical condition, has the shape of a small porcelain evaporating disk with a rim, into which the stem appears inserted. Shreds of the yellow universal veil cling to the rim and the base of the stem. The plant is excellently figured by Fries in the unpublished plate in the Royal Museum at Stockholm, showing the remains of the universal veil. Gillet's figure is also accurate as to color and shape. Cooke's figure (Ill., Plate 713) cannot apply to our plant. Ricken, Saccardo and Britzelmayr give spore-measurements which indicate a related species with much larger spores.

321. Cortinarius velicopia sp. nov.

PILEUS 6-9 cm. broad, convex at first, soon broadly expanded to plane, *violet to buff at first, becoming dingy yellowish-ochraceous* as if stained, with a viscid, separable pellicle, even, glabrous, margin incurved and at first appendiculate from the copious cortina. FLESH pale blue-violaceous, *soon white,* thick, moderately compact.

GILLS narrowed behind, narrowly adnate, moderately broad, close, at length dingy yellowish or pallid, hung with the fibrillose remains then cinereous, finally rusty-cinnamon, *edge minutely fimbriate.* STEM 6-8 cm. long, 8-18 mm. thick, *violaceous-blue, fading to bluish,* at length dingy yellowish or pallid, hung with the fibrilllose remains of the cortina, dry, equal, solid, *with a marginate, subdepressed, hemispherical bulb,* which is clothed by a thin, ochraceous-buff, universal veil. CORTINA very copious, white or faintly bluish. SPORES ventricose-elliptical, *with a prominent, papillate apiculus, very tuberculate,* rather symmetrical, 9-12 x 6-7 micr. Edge of gills provided with inflated, sterile cells. ODOR and TASTE mild.

Gregarious or subcaespitose. Among fallen leaves in mixed or frondose woods. Ann Arbor, New Richmond. September-October. Infrequent.

This may be considered a segregate of *C. caerulescens,* and corresponds to Ricken's description of that species (Blätterpilze, p. 129), but is different from the conception of Maire (Bull. d. la. Soc. Myc. de France, Vol. 27, p. 426) and that shown by the Friesian unpublished plates. The spores of our plant, as well as the very abundant cortina, are quite distinguishing. The colors of the gills and stem incline to blue. Several collections show that the pileus may be deep violet at first in some forms, but eventually the ochraceous-buff color of the universal veil pervades also the surface of the pileus. The universal veil is less manifest and less persistent than in the preceding species.

322. Cortinarius herpeticus Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 849.
Ricken, Die Blätterpilze, Pl. 37, Fig. 4.

PILEUS 3-10 cm. broad, convex, subexpanded, firm, smoky-olive or *olivaceous,* tinged brownish on disk, fading, *with a viscid, separable pellicle,* even, glabrous, margin at first incurved, thin. FLESH thickish, firm, abruptly thin on margin, evanescently violaceous, then whitish. GILLS rounded behind, adnexed-emarginate, close, moderately broad, smoky-violet or *olivaceous* at first, smoky-brown at length clay-color (Ridg.), then smoky-cinnamon. STEM 3-5 cm. long, 8-18 mm. thick, solid, *violaceous-blue at first,* fibrillose by the *whitish cortina,* equal above the marginate-depressed bulb, which

is covered by the remains of a greenish or whitish, thin, universal veil, bulb 1-2 cm. thick. SPORES broadly elliptical, rough, 8-10 x 5-6 micr. ODOR and TASTE mild.

Gregarious. Among mosses in cedar and balsam swamps. Bay View, Michigan, and North Elba, New York. August. Rare.

This was considerd a new species in the "Key" (Jour. of Mycol. 13, p. 35, 1907) as *C. olivaccoides.* It agrees well with the Friesian species as characterized in Monographia. In the 11th Report of the Mich. Acad. Sci., p. 32, it is reported as *C. olivaceus* Pk. *C. olivaceus* Pk. has larger spores and belongs to the section Phlegmacium. *C. herpeticus* appears to be close to *C. scaurus* Fr.

323. Cortinarius olivaceo-stramineus Kauff.

Bull. Torr. Bot. Club, Vol. 32, 1905.

Illustrations: Ibid, Fig. 3, p. 309.
Jour. of Mycol., Vol. 13, Pl. 95, 1907.
Mycological Bull., Vol 5, Fig. 243, p. 317, 1907.

PILEUS 4-7 cm. broad, broadly convex, slightly depressed in the center when expanded, *pale straw-yellow with an olivaceous tinge,* slightly rufous-tinged in age, glabrous or silky-fibrillose, disk sometimes covered with minute scales, *viscid from a gelatinous pellicle,* margin incurved at first, shreds of the cortina attached to it on expanding. FLESH very thick, abruptly thin on margin, *white,* dingy-yellowish in age, *soon soft and spongy.* GILLS sinuate-adnexed, rather narrow, crowded, *whitish at first,* then pale cinnamon, edge serratulate and paler. STEM 6-8 cm. long, 5-18 mm. thick, spongy and soft within, sometimes becoming hollow, white and pruinate above the fibrillose remains of the cortina, *with a slight, subobsolete, submarginate* bulb from whose margin arises the copious white CORTINA; bulb when young covered by a thin universal veil of the same color as the pileus. SPORES ventricose-elliptical, with stout apiculus, almost smooth, granular within, 10-12 x 5.5-6.5 micr. BASIDIA about 38 x 9 micr. ODOR and TASTE mild.

Subcaespitose. On the ground in mixed and frondose woods. August-September. Ann Arbor. Rather rare.

It is with some hesitation placed in this section, as the universal veil is not well developed. The bulb is at first slightly marginate and the cortina is attached to it; later the bulb almost disappears

at times. The plants are sometimes deformed by a fungous parasite, *Mycogone rosea,* causing the gills to remain sterile. It has been found in several states, but is apparently rare.

324. Cortinarius cæsiocyaneus Britz. (Edible)

Bot. Centralbl., 1895, p. 10, 1899, p. 58.
Maire, Bull. de la. Soc. Myc. de France, 26, 1910.

Illustrations: Maire, Bull. de. la. Soc. Myc. de France, Vol. 26, Pl. 8, Fig. 1-2.

PILEUS 5-12 cm. broad, convex then expanded-plane, sometimes depressed on the center, *bluish-violaceous-white to silvery-violaceous,* glabrous, even, *with a viscid, separable pellicle,* silky-shining when dry, margin becoming silky and at first incurved. FLESH pale violet, fading slowly, thick. GILLS rather *narrow, adnexed,* rounded behind then sinuate, thin, *pale violaceous, soon pale alutaceous,* then cinnamon, crowded, edge even or becoming eroded. STEM stout, 4-7 cm. long, 1-2 cm. thick, solid, pale violaceous-white, concolor within, equal above *the large, flattened, marginate-depressed bulb,* which is white on the surface from the *white universal veil,* attached to white mycelium. CORTINA *violaceous-white.* Spores 10-12 (rarely 13) x 6-7 micr., almond-shaped, elliptical, tuberculate, cinnamon in mass. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground among leaves in frondose woods of oak, maple, etc. Ann Arbor. September-October. Infrequent.

This is a segregate of *C. caerulescens* Fr. The whole plant has a rather uniform pale violaceous-whitish color almost exactly like *C. michiganensis.* As in that species, the gills are not at first intensely colored nor at all purple or rosy. It has the large size of *C. atkinsonianus* with which it sometimes occurs. The flattened bulb is white below and on the sides, where it is clothed by the white subgelatinous veil. The spores are larger than in *C. michiganensis* with which it is easily confused and which belongs to another section. Cooke's figures of *C. caerulescens* (Ill., Pl. 721) show the stature and color, but not the characteristic bulb and spores; that plate is referred by Maire (Bull. de la Soc. Myc. de France, Vol. 26, p. 18) to *C. caesiocyaneus* Britz. Ricken places this plant under *C. camphoratus* Fr. but without any good grounds.

325. Cortinarius rubens sp. nov.

PILEUS 3-7 cm. broad, hemispherical then convex-expanded, *vermillion-red to orange-fulvous,* unicolorous, *with a viscid, separable, toughish pellicle,* glabrous, even, shining when dry. FLESH thick, whitish. GILLS adnexed, becoming emarginate, rather broad, close, caesious or pale drab at first, then argillaceous-cinnamon, edge entire and tinged dull citron-yellowish. STEM 4-7 cm. long, 1-1.5 cm. thick, solid, dry, *pale straw-yellow to whitish,* citron-yellowish within, fimbriate from the cortina, equal above the *rounded, marginate-depressed bulb* which is clothed by the *vermillion-red universal veil* except below where it is white and attached to white mycelium. SPORES almond-shaped, very inequilateral, tuberculate, 15-18 x 7-8.5 micr. BASIDIA 45 x 13-15 micr., stout, 4-spored. CORTINA white or tinged with red. ODOR faintly aromatic. TASTE of flesh bitterish-disagreeable, slowly more intense.

Gregarious or subcaespitose. On the ground among leaves in frondose woods of oak, maple, etc., its mycelium attached to *mycorhiza* of undetermined roots. Ann Arbor. October. Rare.

The bright red color of the pileus and the universal veil is striking and is rarely seen in this subgenus. The veil is very evident on the fresh plants and shows on the margin of the bulb as a bright red to orange-red decoration, and in the button stage is continuous with the pellicle of the pileus, breaking in a circumscissile manner like the yellow veil of *C. atkinsonianus.* There is no violet or purple present in the cap although the young gills have a dull violaceous-gray tint called "caesious." The edge of the gills is citron-straw-yellow and, when seen from below, gives the impression of that color to the rest of the gills. It differs from *C. sublateritius* Pk. in its much larger spores and the distinct universal veil. It agrees closely with the description of *C. testaceus* Cke., except in details. Maire, however, says Cooke's plant is identical with *C. rufo-olivaceous* Fr. to which our plant cannot be referred, although related to it. Specimens of our species have also been received from Madison, Wisconsin.

***Gills, flesh and stem yellow at first.*

326. Cortinarius elegantioides sp. nov.

Illustration: Plate LXIX of this Report.

PILEUS 4-7 cm. broad, convex then expanded-plane, *cadmium-yellow, orange-fulvous on disk,* becoming fulvous-ferruginous in age, glabrous, even, *with a glutinous separable pellicle.* FLESH thick, whitish or tinged greenish-yellow. GILLS adnate, becoming deeply emarginate and uncinate, close, *rather broad, varying pale yellowish-white, bright citron-yellow or sulphur-yellow,* at length ferruginous, thin, edge minutely crenulate. STEM 5-8.5 cm. long, rather stout, subequal, 10-18 mm. thick, dry, spongy-stuffed, yellowish-white or citron-yellow, *flesh tinged greenish-yellow,* with a marginate, subdepressed, subturbinate *bulb, which is clothed on the surface by the yellow to subferruginous, subgelatinous universal veil.* CORTINA slight, fugacious. SPORES almond-shaped, elliptical, very tuberculate, 15-18 (rarely 19-20) x 7-9 micr. BASIDIA 48 x 12-13 micr., 4-spored. TASTE of flesh tardily but distinctly *bitter.* ODOR mild.

Solitary or subcaespitose. On the ground in frondose woods of oak, maple, etc. Ann Arbor, Detroit, New Richmond. September-October. Infrequent.

Nearly always solitary or of few individuals. Known by its large spores, bitter taste of the flesh and the tinge of green in the yellow color of the flesh, etc. It has the stature of *C. multiformis* of Cooke (Ill., Pl. 708 and 709), but the spores are distinctive. The bulb is not very broad as compared with that of *C. fulgens* Fr.; it is rather soft and decays early. The stem is narrower upwards at first and colors of the stem. It is closer to *C. sulfurinus* Quel. (sense of Ricken) but differs in its spores, less abundant cortina and the colors of the stem. It is closer to *C. sulfurinus* Quel. (sense of Ricken), but neither Quelet nor Ricken mention the bitter taste nor the universal veil.

Section II. Universal veil not manifest.

**Gills, flesh or stem at first caesious, violaceous, bluish or purplish.*

327. Cortinarius purpurascens Fr. (Edible)

Epicrisis, 1836-38. Obs. 2, 1818.

Illustrations: Cooke, Ill., Pl. 723.
Gillet, Champignons de France, No. 224.
Plate LXXI of this Report.

PILEUS 5-8 cm. broad, broadly convex to subexpanded, *dark purplish-umber or entirely violet-purple when young,* soon discolored and variegated with clay-color or brown, opaque, glabrous, even, *with a viscid, separable pellicle.* FLESH thick, compact, tinged azure or purplish, fading to whitish in age, *but changing rapidly to deep purple when bruised.* GILLS adnexed and rounded behind, then emarginate, rather narrow, close, at first azure-blue or darker, *changing to deep purple when bruised.* STEM usually short, stout, 2-5 cm. long, 10-20 mm. thick, *solid,* subequal, fibrillose from the cortina, *bulb not large, subemarginate* to distinctly marginate, scarcely ever depressed, soon oval, purplish, *flesh quickly deeper-colored when bruised.* SPORES 8-9.5 (rarely 10) x 5-5.5 micr. elliptic-ovate, rough-echinulate, dark in mass. BASIDIA 40-45 x 8-9 micr., 4-spored. ODOR and TASTE mild.

Gregarious, solitary or subcaespitose. On the ground in open woods, sometimes in bare, exposed places where soil is hard. Ann Arbor, Detroit. September-October. Infrequent.

The American plant has more purple in the pileus than shown in my collection from Sweden and as given by European authors. In all other respects it agrees with that of Europe. This is *C. subpurpurascens* in the sense of Ricken. The spore-measurements as given by Massee are too large. We have three related species which might be easily confused by not taking account of the spores: *C. aggregatus* has smaller spores and its flesh and gills do not change to purple when bruised. *C. sphaerosperma* is a much larger plant, with almost spherical spores. The common form of *C. purpurascens* is small, stout and squatty, although more luxuriant specimens occur in favorable weather.

328. Cortinarius subpurpurascens Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 725.
Ricken, Blätterpilze, Pl. 36, Fig. 3. (As *C. purpurascens.*)

PILEUS 5-10 cm. broad, firm, campanulate, discoid or gibbous, then expanded, at length depressed, *viscid, tinged* purple at first, yellow-ochre to ochraceous tawny with smoky-brown stains, scarcely virgate, glabrous, *zoned by the decurved margin.* FLESH soon whitish, *not changing* to purple when bruised, compact. GILLS adnexed-emarginate, crowded, rather narrow, purplish at first then pecan-brown (Ridg.), *becoming purplish when bruised,* edge entire. STEM 5-7 cm. long, 10-15 mm. thick, subequal above the rather small depressed-marginate flattened bulb, pale violaceous, *purplish where bruised,* violaceous within, cortinate-fibrillose, *stuffed then tubular.* SPORES elliptical-oval, 8-9 x 5-6 micr., rough. ODOR slightly of radish after picking, somewhat pungent. TASTE mild.

Gregarious to subcaespitose. On the ground under balsam and spruce. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Infrequent.

This species differs from *C. purpurascens* in its habit, its stuffed to hollow stem and the almost immutable color of the flesh. The gills and stem, however, change to purplish where bruised. It is *C. purpurascens* in the sense of Ricken who seems to have exchanged the Friesian names. It seems to be a species of the higher mountains, and perhaps of the northern forests.

329. Cortinarius aggregatus sp. nov.

PILEUS 5-12 cm. broad, convex then subexpanded, obtuse and usually irregular from crowding, at length undulate, glabrous or white-pruinose when young, *at first bright purple-blue* to purplish-gray, at maturity *becoming smoky olive-gray and streaked,* with a viscid pellicle, margin at first incurved. FLESH thick, *violaceous* then faintly olivaceous-gray to dingy white, *not turning purple when bruised.* GILLS adnexed and rounded behind, then emarginate, close, moderately broad, *violet-purple at first,* then gray to cinnamon. STEM 4-7 cm. long, 10-20 mm. thick, rather short, solid, dry, purplish, darker at base, *the small bulb at the very first subemarginate,* not depressed, disappearing during development. CORTINA *deep violaceous,* rather copious, *attached to bulblet at first,* collaps-

ing on the stem. SPORES narrowly elliptical, 7-8 x 4-4.5 micr. ODOR and TASTE mild.

Caespitose, often in troops forming arcs of scores of individuals. In frondose woods of oak, maple, etc., in the late fall after heavy rains, half hidden by the leaves.

September-November. Ann Arbor. Infrequent, in very wet seasons.

This species is usually quite abundant in its particular woods. As the clusters or closely crowded rows of the fruit-bodies develop, they push up the thick mat of leaves in humps, an appearance which is very commonly produced in frondose woods by the late-growing mushrooms. The young clusters may be so thoroughly hidden by the leaves that they are usually not found till more or less expanded and the changes in color by that time are often extremely confusing. In that case the deep bluish-purple color of the young cap is lost and in the expanded state its surface assumes a distinct olive-gray color and is then often markedly streaked with darker shades. The bulb becomes soft, is often infested by grubs and stained yellowish. It differs from *C. purpurascens* in habit, in different shade of blue on the cap and stem, in the flesh not changing to darker purple when bruised and in the smaller spores. A vigorous cluster of young plants are intensely colored, and often silvery as if covered with hoar-frost. It is related to *C. cyanopus* Fr.

330. Cortinarius sphaerosperma sp. nov. (Edible)

Illustration: Plate LXX of this Report.

PILEUS 8-16 cm. broad, *large,* broadly convex-expanded, with a *very viscid,* separable pellicle, glabrous, even, *deep violet-purple,* micaceous-shining when dry. FLESH soon whitish, *changing* to *purple when bruised,* thick, compact. GILLS adnate *then sinuate-subdecurrent,* crowded, not broad, *purple at first,* then rusty-umber. STEM 6-9 cm. long, 15-20 mm. thick, solid, stout, dry, hung with the dense, spore-stained fibrils of a very copious, purplish CORTINA, *deep purple* like the cap, *the rather small bulb submarginate and disappearing,* at length clavate-bulbous, whitish within, becoming purple when bruised. SPORES spherical or subsphoeroid, very tuberculate-rough, 7-8.5 x 6-7.5 micr., dark ferruginous in mass. BASIDIA 30 x 9 micr., 4-spored, the slender sterigmata 3-4 micr. long. ODOR slightly of radish. TASTE mild.

Solitary or scattered. On the ground in frondose woods of oak,

maple, etc. August-September. Ann Arbor, Detroit. Rather rare.

This magnificent species has only been seen thrice. It was at first passed by as *C. purpurascens* but a careful examination revealed important differences. It may be considered as a segregate of that species, although very likely it is a native of this country. No European author seems to have referred spherical spores to *C. purpurascens* or *C. subpurpurascens,* and in the European plants, both of these species entirely or partly lack the purple color of the cap. No very young specimens were found, and it needs further study. Both this species and the preceding approach the next subgenus in the scarcely marginate bulb.

331. Cortinarius purpureophyllus sp. nov.

PILEUS 5-8 cm. broad, convex-expanded, *dull tawny-red,* fading to ochraceous-fulvous, glabrous, even, *with a viscid,* separable pellicle, margin incurved. FLESH whitish, thick, compact. GILLS rounded behind and adnexed, deep *lilac-purple, color persistent,* narrow, crowded, thin, edge entire or suberoded. STEM 4-6 cm. long, 12-18 mm. thick, equal or slightly narrower upwards, *pallid or slightly tinged* lilac-violaceous at first, spongy-stuffed or solid, fibrillose from cortina, apex violaceous within, *with a marginate-depressed, flattish bulb,* which is white throughout, attached to a white mycelium. CORTINA copious, whitish (?). SPORES almond-shaped, elliptical, tuberculate, 10-12 x 6-7 micr., rusty-cinnamon in mass. BASIDIA 36-42 x 8-9 micr., 4-spored. ODOR slight or none. TASTE slowly disagreeable, somewhat bitter.

Gregarious. Among fallen leaves in frondose woods of maple, oak, etc. Ann Arbor. October-November. Infrequent.

Known by the contrasting colors of pileus, gills and stem, and the size of the spores. The flesh is scarcely tinged with violaceous except at the apex of the stem. The young gills have a deep color as in *C. purpurascens,* but the flesh has none of the characteristics of that species.

332. Cortinarius cærulescens Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 722.
Quelet, Grevillea, Vol. VI, Pl. 105, Fig. 3.
Maire, Bull. de la Soc. Myc. de France, Vol. 26, Pl. 8, Fig. 3-5.

"PILEUS 3-6 cm. broad, convex then convex-plane, quite thick, *with separable, viscid pellicle,* glabrous, even, *violaceous-blue, tinged ochraceous on disk,* sometimes entirely ochraceous-yellow, not hygrophanous, margin at first incurved pubescent and white, then spreading and violaceous. FLESH *pale violaceous-blue,* especially under the cuticle, then whitish, at length ochraceous-stained. GILLS arcuate, then plane or slightly ventricose, attenuate in front, rounded behind, thin, *broad,* rather broadly adnate, *violet-amethyst or violet-blue at first,* then rusty-brown, edge serratulate. STEM 3-5 cm. long, 10 mm. thick, cylindric-conic, *with a marginate bulb,* fibrous-fleshy, dry, silky-fibrillose, *violaceous-blue to amethyst-blue,* bulb white, solid. CORTINA violaceous at first. Universal veil rapidly evanescent. SPORES 12-14 x 6-7 micr., subamygdaliform, elliptic, tuberculate. ODOR feeble, like that of *C. purpurascens.* TASTE mild or slightly bitterish."

The description has been adopted from that of Prof. Maire (Bull. de la Soc. Myc. de France, Vol. 27, p. 424, 1911). In America I have seen specimens of this species only from Tennessee. The species stands out from the segregates of the old species as it was variously interpreted, by its large spores. In specimens from Sweden, I find the same sized spores. In size, color of the young gills and in stature it is much like *C. calochrous.* Cooke's figures (Ill., Pl. 721) and Gillet's figures (Champignons de France, No. 208) are referred by Maire to *C. caesiocyaneus,* which they illustrate fairly well. As Fries did not give spore-measurements, I prefer to follow the decision reached by Maire after he had compared the species which occurs near Stockholm, with those of France. Our American references to this plant must be considered as usually, if not always, based on collections of *C. caesiocyaneus, C. michiganensis* or perhaps *C. calochrous.* It is possible that a number of intermediate forms also occur as I have some collections which apparently support such a conclusion.

333. Cortinarius michiganensis Kauff. (Edible)

Jour. of Mycology, Vol. 13, p. 35, 1907 (synopsis).

PILEUS 8-14 cm. broad, compact, firm, broadly convex then slowly expanded, *pale violaceous to lilac,* unicolor, *color persistent,* glabrous, even, *glutinous when moist or young,* then viscid, margin persistently inrolled and tomentose-silky. FLESH very thick, white or tinged with lilac, not changed by bruising. GILLS rounded behind and adnexed, or almost free, *narrow, crowded, thin,* acuminate in front, *pale violaceous-white at first,* then pale ashy, finally ochraceous-cinnamon, *edge serratulate from the first.* STEM stout, 3-6 cm. long, 18-30 mm. thick, solid, *pale violaceous-lilac* to whitish, fibrillose from cortina, *marginate-bulbous,* bulb large, up to 4 cm. broad, white beneath, flesh white except the violaceous apex. CORTINA bluish-white, at first attached to the bulb, evanescent, not copious. SPORES narrowly elliptic-ovate, almost smooth, 8-10.5 x 4.5-5.5 micr., pale ochraceous-cinnamon in mass. ODOR and TASTE mild.

Caespitose, in small clusters of large individuals. On the ground, among grass or leaves, in low, rich, frondose woods of beech, maple, etc. Ann Arbor, Detroit, New Richmond. August-October. Infrequent.

This species is known by its large size, caespitose habit, pale gills of which the spores mature slowly, and by the lilaceous color of cap and stem. When fresh or young a clear gluten covers the pileus and sometimes the base of the young bulb, as if by a universal veil. It is very like *C. caesiocyaneus* in size and shape, but has a different habit, different color and spores and lacks the white universal veil of that species. It is doubtless in part the *C. caerulescens* of some American lists. *C. caesius* Clem. according to the description, approaches it, differing in its scarcely viscid pileus, the much thicker spores and the white gills.

334. Cortinarius cæsius Clements.

Bot. Surv. of Nebraska, IV, 1896.

"PILEUS 4-8 cm. broad, campanulate-convex, then expanded, fleshy, glabrous, *not or scarcely viscid,* obscurely *dark blue-violaceous,* finally brown-punctate, margin involute. FLESH *bluish-gray,* unchangeable. GILLS adnate, subdistant, *white then cinnamon,* not

violaceous. STEM 1-5 cm. long, 10-15 mm. thick, fleshy-fibrous, solid, violaceous above, *bright yellow below,* turbinate-bulbous, subglobose-when old, bulb 3-4 cm. high and 4 cm. broad, violaceous. CORTINA bluish-gray. SPORES subelliptical or globose, 8-10 x 7-8 micr., verrucose, tawny-brown.

"Related to *C. glaucopus* Schaeff."

The description is adopted from the original. The plant was found in Nebraska and I have not seen it.

335. Cortinarius aleuriosmus Maire var.

Bull. de la Soc. Myc. de France, Vol. 26, p. 22, 1910.

Illustrations: Ibid, Pl. 7, Fig. 4-5.
Ricken, Die Blätterpilze, Pl. 39, Fig. 4.

PILEUS 5-10 cm. broad, very compact, firm, broadly convex *alutaceous-whitish at first, soon dingy ochraceous-tan to russet-tan,* sometimes sordid tawny-yellowish in age, glabrous, *with a glutinous pellicle* when moist or young, surface becoming reticulate-rivulose from the drying gluten, margin inrolled at first. FLESH thick, white or with an evanescent violaceous tinge. GILLS adnexed, *narrow,* crowded, *caesious at first* (i. e., pale livid-grayish), sometimes pallid, then rusty-cinnamon, edge erose-serratulate. STEM 4-6 cm. long, *stout, short,* 10-20 mm. thick, solid, compact, *white or scarcely violaceous-tinged,* fibrillose from the cortina, *with a thick, turbinate, marginate bulb,* bulb not depressed, white below and arising from white mycelium. SPORES elliptical-almond-shaped, minutely tuberculate, 10-12 x 5-6 micr. BASIDIA 30-35 x 7 micr., 4-spored. ODOR and TASTE mild or slight.

Subcaespitose or gregarious. On the ground in frondose woods of oak, maple, etc. Ann Arbor. August-September. Infrequent.

This is doubtless the species reported by Ricken under *C. aleuriosmus* Maire. (See Blätterpilze, p. 136, No. 428). Both Ricken's and my collections seem to be the same species, but differ from the description of the type, given by Maire, in lacking the "bitter taste" in the pellicle of the pileus, and in the slightly smaller spores. Maire's species also had a distinct farinaceous odor and no violaceous nor blue tints in the flesh and stem. The latter point, however, is a variation easily overlooked. There is evidently a series of closely related forms, differing slightly in the amount of violet present and the presence or absence of a slight odor and

taste. However, I suspect the species with the bitter pellicle should be kept distinct. Some of my collections had caps which were more tawny or rusty-ochraceous than the descriptions allow. The fundamental characters are the caesious or pale gray-drâb young gills, the white flesh of the stem and mostly of the cap, and the spores. This species is a segregate of *C. glaucopus* Fr. and some of my collections agree well with the color, size and shape of the Friesian plates at Stockholm, but the flesh, especially of the stem, does not turn yellowish. The European authors agree that the spores of *C. glaucopus* measure 8-9 x 5-6 micr. Forms occur which have a subaromatic odor, resembling ripe pears. As is often the case in this subgenus, when the plant develops during heavy rains, the glutinous pellicle dissolves away in part, and the pileus is later merely subviscid.

336. Cortinarius glaucopus Fr.

Syst. Myc., 1821.

Illustration: Ricken, Die Blätterpilze, Pl. 35, Fig. 7.

PILEUS 5-12 cm. broad, convex, then expanded-plane, firm, rigid, *often wavy on the geniculate margin,* viscid or glutinous, *variegate fulvous-streaked* on a slate-gray or steel-gray ground-color, *margin greenish-gray,* at first inflexed, disk fulvous. FLESH whitish then yellowish-tinged, thick, compact. GILLS adnexed then emarginate, moderately broad, close to crowded, *at first violaceous-blue,* then clay-cinnamon. STEM 5-10 cm. long (sometimes shorter), 15-25 mm. thick, rigid, pallid with a pale violaceous-blue tinge, *becoming yellowish in age,* flesh violaceous-bluish to whitish then sordid yellowish, solid, almost equal above *the abrupt, marginate, scarcely bulbous base,* attached to a white mycelium. SPORES almond-shaped, subinequilateral, slightly rough-punctate, 8-9 x 4-5 micr. BASIDIA 28-30 x 7 micr., 4-spored. ODOR and TASTE mild.

In dense, caespitose troops. On the ground, under or among leaves, in frondose woods of oak, maple, etc. Ann Arbor. September-October. Abundant locally, but infrequent; after heavy rains.

Only the luxuriant form of this species is known to me. A squatty form is said to occur, probably in dry weather. The colors are difficult to describe and vary during development. The fresh, mature pileus usually has a steel-gray metallic lustre in wet weather,

its margin is bent down forming a faint zone, and fulvous shades radiate in streaks from the fulvous center. The bulb is narrow, somewhat thicker than the stem, and scarcely depressed. Its caespitose habit is very marked. No good plate seems to exist. Cooke's figure (Ill., Pl. 712) is entirely misleading, and Gillet's figure (Champignons de France, No. 224), doubtless illustrates another species. It is not at all commmon in the regions I have visited.

***Gills, flesh or stem at first green.*

337. Cortinarius virentophyllus sp. nov.

PILEUS 5-8 cm. broad, convex, expanded-plane, regular, *viscid,* glabrous, *green to olivaceous-yellowish, fading* to pale ochraceous or straw-yellow, sometimes tinged fulvous, slightly streaked by the drying gluten. FLESH thickish on disk, very thin on margin, pallid-greenish, fading, subhygrophanous, with dark watery-green border along the gills. GILLS adnexed-emarginate, thin, close, somewhat narrow, *gray-olive or green at first, becoming deep green,* edge entire. STEM 5-7 cm. long, 10-15 mm. thick, silky-fibrillose at length, *stuffed* by a fibrous pith, becoming hollow, *distinctly cyaneous or pale blue,* fading to violaceous-whitish, bluish within but fading, equal along *the subemarginate bulb,* which becomes oval or subobsolete. SPORES almond-shaped, broadly elliptical, distinctly tuberculate, 9-11 x 6-7 micr. BASIDIA 36 x 9 micr., 4-spored. ODOR mild. TASTE of flesh and pellicle of cap mild.

Subcaespitose in clusters of few individuals. On the ground, among grass in frondose woods of oak, maple, etc. Ann Arbor. October-November. Rare.

This attractive species was found only twice. The cap and gills are deep green when fresh, while the stem is pale blue. The color of the cap and flesh soon fades to pale yellowish except near the gills. The axis of the stem is composed of softer, paler, fibrous tissue which fades quickly and disappears in part leaving the stem tubular. The bulb is not truly depressed-marginate unless in the button stage which was not seen. The species is related to *C. scaurus,* but the pileus is differently colored, not "tiger-spotted," and the stem not solid. The gills and stem are also more brightly colored than in that species. It may be an American variety. The spores agree closely with the measurements given by Ricken for *C. scaurus.* It differs from *C. prasinus* in the glabrous pileus, in stature, and in the spores, which according to Ricken are 13-16 x 6-7 micr. in size. Specimens were seen from Madison, Wisconsin.

***Gills, flesh or stem yellow, fulvescent, or ferruginous.*

338. Cortinarius fulgens Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 716 (doubtful).
Gillet, Champignons de France, No. 223 (doubtful).

PILEUS 6-15 cm. or more broad, firm, broadly convex to plane, bright orange to *orange-fulvous,* disk orange-ferruginous, *somewhat virgate streaked,* very viscid when moist, margin incurved at first. FLESH thick, yellowish then alutaceous. GILLS dilute yellow then *deep ferruginous-orange,* emarginate, *broad,* close, *edge entire.* STEM 4-7 cm. long, 15-25 mm. thick, firm, solid, yellow, *covered by the dense rusty-stained fibrils* of the cortina, equal or subequal above *the large, depressed-marginate bulb.* SPORES almond-shaped, abruptly apiculate, 9-12 x 6-7 micr. ODOR and TASTE mild.

Solitary or subgregarious. On the ground in open beech woods. Ann Arbor. September. Infrequent.

This large species is here interpreted in the sense of Fries as expressed in his unpublished plates at Stockholm. Authors are not agreed as to its identity as shown by their plates, different spore-measurements, etc. Fries' plates show larger plants than indicated in his description, although he says they are "showy, robust and golden." His figures of this and the following species show that the virgate appearance of the pileus of *C. fulgens* was to his mind one of the essential differences. The microscope has shown that probably several species are included under the old ones. Specimens from Bresadola with spores 15-18 x 9-10 illustrate this view. *C. phyllophilus* Pk. (N. Y. State Mus. Bull., 157, 1912), seems to approach our specimens rather closely.

339. Cortinarius fulmineus Fr. var. sulphureus var. nov.

Epicrisis, 1836-38.

Illustration: Plate LXXI of this Report.

PILEUS 5-10 cm. broad, convex then plane, *sulphur-yellow,* scarcely changing to darker, sometimes with spot-like scales on the disk, *viscid,* even, glabrous. FLESH thick on disk, yellow or yellowish-white, rather soft. GILLS adnate, then emarginate, moderately

broad, close, *sulphur-yellow at first,* finally ochraceous-cinnamon, edge becoming eroded. STEM *short,* 3-5 cm. long, 8-18 mm. thick, dry, *pale, sulphur-yellow,* sometimes merely yellowish-white, yellowish within, sometimes compressed, subfibrillose then glabrescent and shining, equal above *the shallow, marginate-depressed bulb* which is yellowish beneath and attached to a yellow mycelium. CORTINA scanty, whitish. SPORES almond-shaped, slightly rough, ventricose, 8-10 x 4-5.5 micr. BASIDIA 30 x 7-8 micr., 4-spored. ODOR none. TASTE mild, of pellicle not bitter.

Solitary or gregarious. On the ground among humus, in frondose or mixed woods. Ann Arbor, Bay View, New Richmond. September-October. Infrequent.

When young the whole plant is pale sulphur-yellow, sometimes paler but uniform in color. In this respect it differs markedly from *C. fulmineus* as described. The figures of the unpublished plates of Fries, however, show a much less orange or fulvous plant than is indicated by the descriptions. It is paler than *C. elegantioides* and lacks the bitterish taste of the pellicle. In the list of the 9th Mich. Acad. Rep. it was referred to *C. sulphurinus* Quel., which differs, in the sense of Ricken, in having much larger spores. Our variety agrees quite closely in the size of the spores with the European *C. fulmineus* as given by Ricken and Saccardo.

340. Cortinarius elegantior Fr. var.

Epicrisis, 1836-38.

Illustration: Ricken, Die Blätterpilze, Pl. 38, Fig. 2.

PILEUS 7-15 cm. broad, compact, firm, convex then expanded, at length wavy and depressed, *tawny-yellow to ferruginous,* glabrous, even, *with a very viscid, separable pellicle.* FLESH whitish or tinged ochraceous, thick. GILLS adnate becoming emarginate, close, rather broad, *yellowish-pallid at first, at length rusty-cinnamon,* edge serrate-eroded. STEM 4-6 cm. long, 10-25 mm. thick, solid, pallid, *becoming rusty-yellow,* fibrillose from the abundant cortina, equal above *the marginate bulb* which is scarcely depressed, *becomes rusty-yellow* and is attached to a yellowish mycelium which forms *mycorhiza.* SPORES almond-shaped, elliptical, tuberculate, 12-14 x 7-8 micr. ODOR and TASTE mild.

Subcaespitose or gregarious. On the ground, among leaves, in frondose woods. Ann Arbor. October. Rare.

This species forms mycorhiza on the red oak; the yellow mycelium was found connecting the mushrooms and the rootlets of the tree and on examination the latter were found to be ectotrophic mycorhiza. Our plants depart somewhat from the descriptions of the European *C. elegantior,* but the spores and color and other major characters are the same. It may be considered as a variety until more extensively collected. It differs from *C. fulgens* in its large spores, the pallid color of the very young gills and stem and the serrate edge of the gills. The color changes markedly to rusty or fulvous as the plant becomes mature. The bulb is not as large and depressed as in *C. fulgens.* In the European plant the color shades slightly into olive, as in our *C. elegantioides.*

341. Cortinarius corrugatus Pk.

N. Y. State Mus. Rep. 24, 1872.

Illustrations: N. Y. State Mus. Mem. 4, Pl. 58, Fig. 8-15, 1900.
White, Conn. State Geol. & Nat. Hist. Surv., Bull. 15, Pl. 21, 1910.

PILEUS 5-10 cm. broad, broadly campanulate, obtuse, *viscid* when moist, coarsely and radiately corrugate or reticulate, *tawny or yellowish-ferruginous,* varying to yellow or ochraceous. FLESH white, thin on margin. GILLS adnate, rather broad, close, *transversely striate,* pallid or obscurely purplish-tinged at first, *soon ferruginous-cinnamon,* edge eroded at length. STEM 7-12 cm. long, 6-16 mm. thick, *long cylindrical,* often fibrillose, spongy-stuffed, often hollowed by grubs, scurfy at apex, yellowish or tawny-yellow, *with a rather small, rounded-oval bulb* which is clothed when fresh by the thin, tawny, adnate and viscid remains of a *universal veil,* pallid or concolor within. CORTINA almost lacking, evanescent. SPORES broadly elliptical, very rough-tuberculate, variable in size 10-15 x 7-10 micr. (usually 12-13 x 8-9 micr.). BASIDIA clavate, 45-48 x 12 micr., 4-spored. ODOR rather pleasant. TASTE mild.

Gregarious or subcaespitose. On mossy or moist ground in low or swampy, frondose woods. Vicinity of Detroit; but probably throughout the State. July-October. Not infrequent in appropriate habitats.

This is a curious species whose early button stage alone shows its relation to the subgenus Bulbopodium. Later there is no margin noticeable on the bulb, and no sign of the early attachment of the

cortina. The cortina, in fact, disappears very early, if present at all. In the young stage, however, the cap has a much smaller width than the bulb, and appears to rest upon it in the way characteristic for this sub-genus. The species is easily known by its corrugated cap, the peculiar yellow or tawny-yellow color of the long stem and the large spores. Saccardo quotes the size of spores incorrectly. Peck has named a form with "appressed spot-light scales" on the pileus, var. *subsquamosus.*

*****Gills, flesh and stem at first white, pallid or pale alutaceous.*

342. Cortinarius sublateritius Pk.

N. Y. State Mus. Rep. 54, 1901.

"PILEUS 5-7.5 cm. broad, broadly convex or nearly plane, glabrous, *viscid, light red,* margin incurved. FLESH white. GILLS adnexed, emarginate, close, thin, plane, *pallid at first,* becoming *cinnamon.* STEM short, 3-6 cm. long, 6-10 mm. thick, equal or slightly tapering upward, stuffed, silky, *whitish, abruptly bulbous.* SPORES ventricose-elliptic, abruptly-short, pointed at each end, rough-tuberculate, 10-12.5 x 5-6.5 micr.

"Woods. Westport, N. Y. October."

The description is adopted from that of Peck who says it is apparently related to *C. testaceus* Cke. which, according to Maire is *C. rufo-olivaceus* Fr., but from which it differs in its smaller size, stuffed stem and smaller even spores. It also differs from *C. rubens* in the spore character, as I satisfied myself by a study of the type specimens at Albany, N. Y.

343. Cortinarius multiformis Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 708, 709.
Quelet, in Grevillea, VI, Pl. 104, Fig. 4.
Ricken, Die Blätterpilze, Pl. 39, Fig. 1.
Plate LXXII of this Report.

PILEUS 5-10 cm. broad, soon convex then expanded-plane, regular, *canescent-white-hoary when young, viscid,* soon ochraceous-buff, *becoming pale ferruginous-orange,* with a separable pellicle, at

length somewhat dry and subshining, sometimes wrinkled in age from the drying gluten, margin inrolled. FLESH pallid-white at first, at length somewhat discolored, sublutescent. GILLS attenuate-adnate, then emarginate, close, not broad, *at first whitish, then alutaceous-cinnamon,* edge eroded at maturity. STEM 4-9 cm. long, 10-20 mm. thick, spongy-solid, subfibrillose, *white at first* then alutaceous, equal above the *marginate or sometimes scarcely marginate bulb,* which becomes oval at length. CORTINA *white,* scanty, *fugacious.* SPORES subfusiform-elliptical, scarcely at all rough, 7-9 x 4-5.5 micr., pale, *not becoming rusty.* BASIDIA 25-30 x 7-8 micr. ODOR and TASTE mild.

Gregarious. On the ground, in mixed woods, so far only collected in the conifer regions of the State. Bay View, New Richmond, September. Infrequent.

The button stage is white or whitish throughout, but during development it discolors more or less, assuming yellowish or rusty-ochraceous shades. Our plants never become as deep orange-rusty, so far as I have seen, as do the European plants. Specimens collected near Stockholm, showed a tendency to change from white in the button to tawny-orange in age. The species is distinct from others in the peculiar delicate hoary-white covering of the young plant, which sometimes remains on the surface of the pileus as hoary spots even after expansion. This may be considered as a form of universal veil, but is quite different in texture from the universal veil of the first section. This hoariness is best seen when plants are growing in dry weather, and reminds one of that of *Pholiota caperata.* The spores and gills are rather pale for a Cortinarius, and the species therefore approaches Hebeloma.

344. Cortinarius intrusus Pk. (Edible)

Bull. Torr. Bot. Club, Vol. 23, p. 416, 1896.

Illustration: Plate LXXIII of this Report.

PILEUS 2.5-6 cm. broad, convex-expanded, *soon plane* and subdepressed, glabrous, *whitish to dull clay-color,* sometimes tinged tawny-ochraceous or reddish, *viscid when moist,* even or radiately wrinkled. FLESH whitish, *thin.* GILLS rounded behind, adnexed or almost free, thin, close, not broad, *whitish at the very first,* soon creamy-yellowish to tawny-ochraceous, *finally umber-brown,* edge subcrenulate. STEM 3-6 cm. long, 4-10 mm. thick, *stuffed to hollow,*

whitish, at length stained by the spores, even or striate above, minutely floccose at first, glabrescent, equal or tapering, *more or less abruptly bulbous.* SPORES elliptic-oval, smooth, 6-7.5 x 4-5 micr., brownish-cinnamon in mass. BASIDIA 25-26 x 5-7 micr., 4-spored. Sterile cells on edge of gills, small, capitate, as in Galera. ODOR and TASTE slightly of radish.

Singly or in small clusters in mushroom beds, in flower beds in conservatories, plant pots, etc.

In the winter months. Received from green-houses in Michigan; reported from various points in New York, New Jersey and Massachusetts.

To quote from Dr. Peck, "Its habitat is peculiar, but it possibly finds its way into conservatories and mushroom beds through the introduction of manure or soil or of leafmould from the woods. It seems strange that it has not been detected growing in the woods or fields." McIlvaine says, "Several pints of it were collected in February—usually a famine month for the mycophagist. The crop continued well into the spring. They grew on the ground, in beds among plants, and with potted plants in a hot-house. The species is delicate, savory and a most accommodating renegade of its kind."

This species is not only unusual in its selection of a place to fruit but also departs somewhat from the usual generic characters of the genus Cortinarius. Its spores are of a peculiar color and in some respects it resembles the genus Hebeloma, and may yet be referred to that genus. Its development has not been sufficiently studied.

345. Cortinarius albidus Pk.

N. Y. State Museum, Rep. 44, 1891.

Illustration: Ibid, Pl. 3, Fig. 1-4.

PILEUS 5-10 cm. broad, convex, then expanded, *white or whitish,* even, glabrous, *with a separable, viscid pellicle,* shining when dry. FLESH thick, white. GILLS adnexed-emarginate, moderately broad, close, thin, *white at first,* then pale alutaceous to cinnamon, edge even. STEM 5-8 cm. long, 8-16 mm. thick, solid, *white,* fibrillose from the cortina, *with an oblique, marginate-depressed bulb,* attached to white mycelium. CORTINA white, copious. SPORES elliptical, scarcely rough, 9-11 x 5-6.5 micr. ODOR and TASTE mild.

Gregarious. On the ground in low, frondose woods. Ann Arbor. September-October. Infrequent.

Known by the white color of all its parts, although the pileus may become buff in age and sometimes the bulb is discolored somewhat by rusty hues. It differs from pallid forms of *C. multiformis* in its spores and larger bulb.

SUBGENUS PHLEGMACIUM: Stem dry, firm, *exposed from the beginning,* becoming clavate-bulbous to equal, never marginate-bulbous; cortina superior, collapsing on the upper or medium portion of the stem. Pileus with a *viscid* pellicle.

This includes the sections "Cliduchii" and "Elastici" of Fries. The development from the "button" stage is very different from that of the subgenus Bulbopodium. The stem is evident from the first, and the cortina is necessarily attached differently, connecting stem and margin of pileus. A universal veil, similar in structure to that of the preceding subgenus, may be present in the young stage and in such cases persists under favorable conditions as delicate shreds or as a closely adnate sheath to the lower part of the elongated stem. Of the European species which have this veil, e. g. *C. cumatilis* Fr., *C. varicolor* Fr., *C. triumphans* Fr., etc., only one has been with certainty observed in this country. Details on this point, with respect to American species, are also not at hand, so that I am compelled to arrange our species on a merely temporary basis. The number of Michigan species which belong to this subgenus that have so far been observed are relatively few, and, except for the type specimens of Peck's species which have been examined, I have seen few collections that can be placed here.

Section I. Universal veil clearly manifest.

346. Cortinarius triumphans Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 141, Fig. 1.
Gillet, Champignons de France, No. 252.
Cooke, Ill., Pl. 692.
Ricken, Blätterpilze, Pl. 41, Fig. 2.

PILEUS 5-10 cm. broad, convex-plane, obtuse, viscid, spotted with superficial patches of the veil, or glabrous and appressed-subtomentose on drying especially on disk, even, *apricot-yellow to ochraceous-*

orange (Ridg.), finally becoming tawny. FLESH soft, white, thick on disk. GILLS at first adnate-subdecurrent then sinuate to emarginate, close, moderately broad, *at first caesius-whitish,* then ochraceous-buff to argillaceous, edge entire. STEM 8-12 cm. long, 1-2 cm. thick above, clavate-bulbous or rounded-bulbous, solid, at first sheathed by a whitish universal veil which is *at length broken into yellowish-ochraccous annular patches terminating above in a ring.* SPORES elliptical, almond-shaped, 12-15 x 6-7.5 micr., tuberculate, rusty-yellow. ODOR and TASTE slightly of coal-tar or radish.

Gregarious to subcaespitose. On the ground in forests of balsam-fir. Adirondack Mountains, North Elba, New York. Collection Kauffman. September, 1914. Rare.

A large, northern species agreeing in all respects with specimens which I collected at Stockholm, Sweden. The collapsed cortina unites with the upper portion of the universal veil to form a band-like annulus. It was reported from New York by Peck in N. Y. State Mus. Bull. 150, 1910. Not yet found in Michigan.

347. Cortinarius maculipes Pk.

N. Y. State Mus. Rep. 54, 1901.

"Pileus 3-6 cm. broad, convex, becoming nearly plane, glabrous, but *covered with a tenacious gluten, bay-red,* becoming paler with age. FLESH whitish. GILLS thin, close, rounded behind, slightly adnexed, *whitish at first,* becoming brownish-cinnamon. STEM 5-7.5 cm. long, 6-12 mm. thick, equal or slightly tapering upward, *subradicating,* solid or stuffed, silky-fibrillose, scaly-spotted, sometimes slightly annulate. SPORES elliptical, scarcely rough, 7.5-9 x 5-6 micr."

The pileus of dried specimens is chestnut-brown and shining. Saccardo gives the spore-measurements much larger, which is clearly an error. Peck says "its prominent characters are the dark-colored pileus smeared with tenacious gluten, the pale young gills and the spotted stem. The spots are formed by the brown fibrils that at first coat the stem, and resemble those of *Armillaria megalopus* Bres." as shown in Fung. Trid., Pl. 47. These scaly spots are clearly the remains of a universal veil. The type specimens are of moderate size.

Section II. Universal veil not manifest.

**Gills at first violet, bluish, purplish or caesious.*

348. Cortinarius sphagnophilus Pk.

N. Y. State Mus. Rep. 29, 1878.

"PILEUS 5-7.5 cm. broad, convex to expanded, glabrous, *viscid, pale brown,* marked *with dark watery spots* especially on the margin. GILLS moderately broad, *subdistant,* transversely rugulose, *at first violaceous* then cinnamon. STEM 10-15 cm. long, silky, striate, *violaceous-white,* then cinnamon, *with an oval bulb at base.* SPORES oblong-elliptical, slightly rough, 10-11.5 (rarely 12.5 micr.) x 5.5-6 micr."

Found in sphagnous marshes, New York. The description is adapted from that of Peck and from his drawings. The pileus is represented as pale smoky brown, the stem almost white and with an oval bulb. "The spotted pileus is a distinctive feature."

349. Cortinarius lanatipes Pk.

N. Y. State Mus. Rep. 42, 1889.

"PILEUS 2.5-7.5 cm. broad, broadly convex or nearly plane, *viscid, grayish,* often tinged with yellow, becoming yellowish or subfulvous and *virgate* with innate tawny fibrils when old. FLESH whitish. Gills adnexed, narrow, close, *pale violaceous at first.* STEM short, 3-5 cm. long, 6-10 mm. thick, *equal or tapering upward above the oval bulb,* solid, subannulate, silky above the annulus, loosely fibrillose-tomentose below, white. CORTINA white. SPORES elliptical, 7.8.5 x 4-5 micr."

In spruce groves, New York. September. The cortina is probably very copious, although it is possible that a white universal veil is also somewhat in evidence. The virgate pileus which changes color in age and the "woolly" covering of the stem are, according to Peck, the distinguishing marks. The type-specimens show that its place is in this group. The plants are not large. This approaches *C. glaucopus* Fr. in some respects.

350. Cortinarius claricolor Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 142, Fig. 2.
Gillet, Champignons de France, No. 205.
Cooke, Ill., Pl. 693.
Ricken, Blätterpilze, Pl. 41, Fig. 1.
Quelet, Grevillea, Vol. VI., Pl. 102, Fig. 1.

PILEUS 5-10 cm. broad, firm, obtusely convex, at length broadly convex to plane, subdiscoid, glutinous when moist, shining when dry, even, glabrous, raw-sienna color to *orange-buff* (Ridg.), *unicolorous,* not virgate, margin incurved and cortinate. FLESH compact, *white,* thick on disk. GILLS emarginate-adnexed, *rather narrow,* close, *at first caesious to pale brownish-drab* (Ridg.), finally clay-color, *edge erose-serrate.* STEM 5-8 cm. long, round-bulbous to clavate-bulbous, 12-15 mm. thick above, bulb up to 2 cm. thick, *white,* firm, solid, fibrillose or floccose-fibrillose. SPORES almond-shaped, 8-10 x 5-6 micr., punctate-rough, pale rusty-ochraceous. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground among spruce and white pine needles. Adirondack Mountains, North Elba, N. Y. September, 1915. Collection Kauffman. Infrequent.

The cracked surface of the pileus and the densely floccose stem, said to be characteristic of the species in Europe, were not characters of the North Elba plants. The stems however, were quite silky-fibrillose with white fibrils. The universal veil is lacking. The spores agree only with the measurements of Britzelmayr. Other authors give larger spores, 10-12 x 7-8 micr., and segregation may become necessary. The bulb may be subemarginate at first, but it is not depressed and the cortina is superior.

351. Cortinarius lapidophilus Pk.

N. Y. State Mus. Rep. 31, 1879.

"PILEUS 5-7.5 cm. broad, at first hemispherical, then convex-expanded, *at first cinereous,* becoming ochre-tinged, often crowded and irregular, *virgate* with appressed fibrils. FLESH whitish. GILLS crowded, *dark-violaceous at first,* then argillaceous-cinnamon. STEM 5-10 cm. long, 6-10 mm. thick, solid, *equal or slightly thick-*

ened at base, whitish." SPORES (of type specimens) broadly elliptic-oval to *subglobose,* rough-punctate, 7-8-x 6 micr.

Subcaespitose. Rocky soil in woods, New York. August.

The pileus of the dried type specimens is dark cinereous. It appears to approach *C. infractus* Fr. in some of its forms and especially as to its spores.

352. Cortinarius copakensis Pk.

N. Y. State Mus. Rep. 31, 1879.

"PILEUS 3-7.5 cm. broad, convex then expanded, often crowded and irregular, *viscid, corrugated, pale ochre* slightly tinged red. GILLS broad behind, subdistant, *violaceous at first,* the interspaces veiny, edge eroded. STEM 5-7 cm. long, rather slender, 4-8 mm. thick, *equal or tapering upwards,* stuffed, silky, whitish." SPORES broadly elliptical to *subglobose,* rough-punctate, 7-9.5 x 7 micr.

"*Subcaespitose.* On the ground in woods. New York. October."

The plants are not large, and the pileus is said to be glabrous and shining when dry. The gills are alutaceous-cinnamon in the dried type-specimens.

353. Cortinarius albidipes Pk.

N. Y. State Mus. Bull. 157, 1912.

Illustrations: Ibid, Pl. 128, Fig. 1-6.

"PILEUS 5-10 cm. broad, compact, hemispheric then broadly convex, obtuse or subumbonate, *viscid,* glabrous and shining when dry, *buff color.* Flesh white. GILLS 4-6 mm. broad, moderately close, *pale violaceous at first,* cinnamon when mature. STEM 5-8 cm. long, 10-15 mm. thick above, *clavate-bulbous and tapering upward,* firm, solid, silky-fibrillose, *white.* SPORES subglobose, 8-10 x 7-9 micr. TASTE mild.

"Among fallen leaves in woods. New York. September.

"A fine, large species, easily recognized by its buff, viscid cap, its violaceous young gills and its white stem thickened or bulbous at the base." As in most of this subgenus, the spores are said to lodge on the remains of the white webby cortina, and form a conspicuous rusty or cinnamon-colored ring near the top of the white stem.

354. Cortinarius decoloratus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 729.
Quelet, in Grevillea, Vol. 7, Pl. 107, Fig. 4.

PILEUS 3-7 cm. broad, convex then expanded, *buff or pallid clay-color,* regular, *viscid,* slightly corrugate when dry. FLESH thin, watery, *soft,* white. GILLS adnate, sometimes subdecurrent, sinuate, close, moderately broad, *caesious or pallid-gray at first* then pale cinnamon. STEM 5-7 cm. long, 3-8 mm. thick, equal or tapering upward, stuffed then hollow, *whitish,* sometimes striate above, obscurely spotted with ochraceous shreds of the veil. SPORES subglobose to oval, almost smooth, 8-9 x 6-7.5 micr.

Gregarious or scattered. In moist places in frondose woods. Ann Arbor. September. Infrequent.

A closely related form has a bitter taste according to some authors. The caesious color of the gills is soon obscure or lacking. It has not been found in quantity and the spores of our plants are slightly too large.

***Gills at first olivaceous or sooty-olivaceous.*

355. Cortinarius infractus Bres. (ex. Pers.)

Fung. Trid., Vol. 2, 1892.

Illustrations: Ibid, Pl. 163.
Cooke, Ill., Pl. 704 (Pl. 705 as *C. anfractus* Fr.).
Quelet, in Grevillea, Vol. 6, Pl. 104, Fig. 3 (as *C. anfractus*).
Ricken, Die Blätterpilze, Plate 43, Fig. 2, et. al.
Plate LXXIII of this Report.

PILEUS 5-10 cm. broad, convex then expanded, *viscid,* glabrous, even, *dark olive or sooty-olive* then tinged fulvous, *margin broadly incurved,* then spreading and often with a broad zone. FLESH whitish or slightly violaceous-tinged, firm, thick except on margin. GILLS narrowed-adnate, sometimes emarginate or spuriously subdecurrent, crowded to almost subdistant, rather narrow, sometimes broader, *dark olive or sooty-olive,* at length umber, edge crenulate-eroded. STEM 5-9 cm. long, 8-15 mm. thick, solid, clavate or with oval bulb, fibrillose, *dull violaceous above,* dingy whitish to olivace-

ous below. SPORES subglobose to oval, rough-punctate, 7-8 x 5-6.5 micr. BASIDIA 30 x 7 micr., 4-spored. ODOR slight. TASTE of pellicle or pileus *bitter.*

Gregarious. On the ground in mixed and frondose woods. August-October. Ann Arbor, Marquette, New Richmond. Infrequent.

This is a variable species, and was placed by Fries under two names: *C. infractus* and *C. anfractus.* Bresadola combined these and gives an excellent description. Ricken (Blätterpilze, p. 144) has again attempted to segregate them. There is no doubt that forms occur which might be kept apart on the basis of different shades of color, stature, etc. Our plants often have narrow adnate gills but luxuriant specimens occur with broad gills. In all forms which seemed to belong here, the pellicle of the pileus was bitter. According to Ricken this would be *C. subsimile* (Pers), but the colors do not agree with that. In all these forms the spores are said to be practically of the same size and shape. Further study on our plant is necessary if they represent different species.

356. Cortinarius olivaceus Pk.

N. Y. State Mus. Rep. 24, 1872.

"PILEUS 3-5 cm. broad, convex then expanded, glabrous, *viscid,* dark brown with a greenish or olivaceous tinge. FLESH *grayish.* GILLS close, rather broad, at length ventricose, *dark olivaceous at first,* then cinnamon. STEM 6-8 cm. long, 6-10 mm. thick, equal, stuffed to hollow, *white-violaceous,* thickened below *with an oval* bulb." SPORES elliptical, very rough, tuberculate, 10-12.5 x 6-7.5 micr.

On the ground, in woods. New York. September. A study of the type-specimens and accompanying drawings show that this species is to be placed in the present subgenus. The spores differ markedly from those of *C. infractus* and *C. herpeticus,* both in size and shape. It approaches *C. luteofuscus* more closely.

357. Cortinarius longipes Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 5-8 cm. broad, convex to expanded, slightly fibrillose, *viscid, yellowish or pale ochraceous.* GILLS close, plane, *brownish-olivaceous at first,* then cinnamon. STEM *elongated,* 10-15 cm.

long, 6-8 mm. thick, *tapering upward,* slightly fibrillose, whitish." SPORES broadly elliptical to subglobose, slightly rough, 6-7.5 x 5-6 micr.

Ground in woods. New York. September.

Related to *C. anfractus* by the spore-characters, but it differs much in the elongated stem and color of pileus. In statue it is more like *C. ophiopus* Pk.

358. Cortinarius glutinosus Pk.

N. Y. State Mus. Rep. 43, 1890.

"PILEUS 2.5-7 cm. broad, convex, *glutinous, brownish-ochraceous,* margin narrowly involute. FLESH yellowish. GILLS adnexed, rather broad, *olivaceous.* STEM 3-7 cm. long, 6-10 mm. thick, solid, whitish or pallid, thickened at the base, *scarcely bulbous.*" SPORES broadly elliptical to subglobose, minutely rough, 7-8 x 5.5-6.5 micr.

On mossy ground, Adirondack Mountains, New York. July.

The type-specimens show a rather medium-sized plant; the pileus is dark, dull, rufous-brown when dried, the gills rather broad and not crowded. "The prominent features," says Peck, are "the dull ochraceous pileus, olivaceous gills and pallid stem. The margin of the pileus is sometimes rimose." It seems related to *C. infractus* by its spores and gills, but is apparently distinct because of the change of color of the pileus on drying.

****Gills at first yellow.*

359. Cortinarius luteo-fuscous Pk.

N. Y. State Cab. Rep. 23, 1872.

"PILEUS 5-6 cm. broad, broadly convex, even, glabrous, *viscid, pale fuscous to smoky-brown.* GILLS deeply emarginate, rather broad, rather close, *yellow at first,* at length cinnamon. STEM 9-10 cm. long, 6-8 mm. thick, equal above, *with a rounded-oval bulb* below, solid, silky-striate, *whitish.*" SPORES broadly elliptical, obtuse, somewhat rough, 12-13 x 6-7.5 micr.

On the ground in woods. New York. October.

This species is closely related to *C. olivaceus* Pk. both in stature, habit and spore-size. The colors differ somewhat and it needs fur-

ther study. The spores are given too large in the original description. The measurements given above were made from the type specimens.

****Gills at first white or pallid.*

360. Cortinarius coloratus Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustration: Plate LXXIV of this Report.

PILEUS 5-10 cm. broad, convex then broadly campanulate and discoid, *bright reddish-yellow to tawny-orange and shining,* becoming dull testaceous, glabrous, even, sometimes radially cracked on drying, *with a viscid pellicle,* margin at first incurved. FLESH whitish, thick except margin, firm, compact. GILLS adnate at first, becoming emarginate, *rather broad,* close, rigid becoming crisped on drying, thin, *whitish or pallid at first,* then pale clay-color to cinnamon-brown, *not reaching the margin of the pileus,* edge paler. STEM 5-12 cm. long, *clavate-bulbous,* 8-12 mm. thick above, 20-30 mm. thick at bulb, solid, firm, at first white and silky-fibrillose from the cortina, *white within, slightly* lutescent, marked at times by the thin remains of an evanescent, yellowish-tawny universal veil, attached at base to delicate *white* mycelioid strands. CORTINA white, cobwebby, not very copious. SPORES almond-shaped, elliptical, distinctly rough, 9-11 x 6-7 micr. BASIDIA 35-40 x 8-9 micr., 4-spored. ODOR and TASTE slight.

Gregarious. On the ground among fallen leaves in frondose woods of oak, maple, etc. Ann Arbor. September-October. Infrequent.

This is a noble species, well-marked and brightly colored when fresh. It seems closely related to *C. saginus* Fr. and may be the American form of that species. See figures of *C. saginus* (Cooke, Ill., Pl. 703, and Quelet, in Grevillea, Pl. 92), which show a much stockier plant without the reddish color which pervades the pileus of our species. The universal veil is almost obsolete and leaves only one or a few very narrow yellow-tawny marks across the stem. The bulb varies from heavy clavate to rounded-oval, depending on the amount of elongation of the stem. When crushed the flesh sometimes gives forth a slight aromatic-radishy odor. It has been collected in several states.

361. Cortinarius ophiopus Pk.

N. Y. State Mus. Rep. 30, 1878.

"PILEUS 5-10 cm. broad, convex or subcampanulate, then expanded, sometimes irregular, *viscid*, glabrous, *reddish-yellow*, the paler margin sometimes roughened by adhering patches of the whitish veil. FLESH white. GILLS close, rather broad, *brownish-cinnamon*, edge often eroded. STEM 10-15 cm. long, 8-12 mm. thick, equal, *long* and usually much bent or variously curved, at first shaggy-scaly from the subconcentrically arranged fragments of the copious veil, *white or yellowish*. SPORES elliptical, inequilateral, 11-12 x 6-7 micr.

On the ground, among leaves in woods. Maryland. September.

The dried type-specimens have much the appearance of *C. corrugatus* in stature and colors, with a yellowish stem; the spores, however, are smaller, and the bulb seems to be lacking.

362. Cortinarius communis Pk.

N. Y. State Cab. Rep. 23, 1872.

PILEUS 2-6 cm. broad, convex-expanded, obtuse, *whitish with a gray tinge at first*, becoming yellowish or brown in age, *subviscid*, sometimes reddish, *glabrous*, margin decorated at first by white fibrils of the cortina. GILLS emarginate, at length subdecurrent by tooth, medium broad, close, *white to pallid at first*, then pale ochraceous-cinnamon. STEM 4-6 cm. long, 4-6 mm. thick, stuffed to hollow, *equal* or nearly so, curved at base, mealy at apex, subfibrillose, *white* then yellowish-stained. SPORES ventricose-elliptical, 9-10.5 x 5-6 micr. Smooth. TASTE slightly bitterish. CORTINA white.

Gregarious. On grassy ground, in frondose woods. May. Ann Arbor. Infrequent.

The spores and gills are pale brown at maturity, and in this respect depart from the characters of the genus. As Peck has pointed out (N. Y. State Mus. Rep. 30) it is much like Pholiota in these characters. The cortina, however, forms no annulus. The plants appear early with us, while Peck reports it for September-October.

SUBGENUS INOLOMA: Pileus and stem *neither viscid nor hyproghanous*. Pileus at first innately scaly, fibrillose or silky; flesh rather thick. STEM stout, the base enlarged and tapering upward, i. e., clavate-bulbous. Universal veil present or lacking.

This subgenus is composed of species which have the stature of the larger Telamoniae but in that sugbenus the pileus is hygrophanous and subglabrous and when silky or fibrillose the fibrils are superficial. A few species are included here which have a slight hygrophanous character. A few more are added which have a rather equal stem, but show their affinity by the stout habit. One group possesses a universal veil which persists on the stem in the form of an adnate sheath or annulus. In my paper (Bull. Torr. Bot. Club., Vol. 32, p. 305, 1905) this group was eliminated from the diagnosis of this subgenus as there given, but further study has convinced me that a more consistent and natural arrangement would be the recognition of the universal veil under it. The smaller Inolomas gradually approach the subgenus Dermocybe, so that the species of these two groups cannot always be readily distinguished. The stout clavate stem and scaly pileus throw a plant into the Inoloma group, while the small size, the thin flesh of the pileus and the more slender, equal stem indicate a Dermocybe.

Section I. Universal veil manifest on the stem in the form of an appressed sheath.

**Gills at first violaceous, lilac or purplish.*

363. Cortinarius alboviolaceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 151, Fig. 3.
Cooke, Ill., Pl. 747 (faded).
Gillet, Champignons de France, No. 191.
Marshall, The Mushroom Book, Pl. 14 op. p. 65, 1905.
Hard, Mushrooms, Fig. 237, p. 295, 1908.
Ricken, Die Blätterpilze, Pl. 44, Fig. 5.

PILEUS 3-6 cm. broad, companulate at first, then convex and broadly umbonate, dry, beautifully appressed silky, *shining,* varying pale violaceous to caesious-buff, *soon silvery-white and scarcely violaceous-tinged,* even, margin persistently decurved. FLESH thin on margin, *caesious or tinged violet,* surface differentiated into a thin layer, up to 15 micr. thick, composed of narrow, horizontal hyphae about 3 micr. in diam. GILLS at first adnate, then emarginate or slightly subdecurrent, close, moderately broad, varying *pale violet*

to ashy-purplish at first, soon paler, at length cinnamon-brown, edge eroded-crenulate. STEM 4-8 cm. long, *clavate-thickened at or near the base, narrowed* upwards, 5-9 mm. thick above, up to 20 mm. below, spongy-stuffed, *usually peronate by thin, white, appressed, silky-interwoven, soft universal veil,* violaceous above and beneath the veil. CORTINA white. SPORES 6.5-9 x 4-5 (rarely 10 x 5.5), elliptic-oval to narrow-elliptical, scarcely rough, *variable in size.* BASIDIA 30 x 6-7 micr., 4-spored. ODOR and TASTE mild. MYCELIUM white.

Gregarious. Among leaves or in deep humus of hemlock, mixed or frondose woods. Throughout the State. August-October. Scarcely infrequent.

It is possible that this species may be composed of an aggregation of several forms. One form has more uniform and smaller spores and the surface layer of the pileus becomes subgelatinous in wet weather. I would call this forma *pulchripes,* since the stem is beautifully marked by the violaceous color above the white sheath. Its spores measure 6-7.5 x 4-5 micr. In all other respects it shows the characteristics of *C. alboviolaceus.* All forms have the same development. In the young plant, the stem is relatively stout and clavate-subconic, with a more or less helmet-shaped young cap, scarcely broader than the stem, mounted on its apex. The mature stem is somewhat irregularly ventricose-thickened, sometimes above the base, sometimes truly clavate-bulbous. The color is typically violaceous-white but varies to deeper violaceous in the gills and flesh and the very young button is deeper violet in the interior. The color fades somewhat, but dried specimens always show the gray or violet tints. I have not been able to distinguish *C. malachius* Fr., an European plant, in this region. The nearest relative of *C. malachius* with us seems to be *C. obliquus* Pk.

364. Cortinarius subpulchrifolius sp. nov.

Illustration: Plate LXXV of this Report.

PILEUS 4-10 cm. broad, firm, subhemispherical at first, then broadly convex to expanded, often gibbous, obtuse, *not hygrophanous, innately silky-tomentose,* glabrescent, even, *grayish-buff,* becoming ochraceous or rusty stained in age, margin at first incurved, then spreading and whitened by the veil. FLESH *thick,* compact, pale caesious then whitish. GILLS adnate at first, becoming sinuate-subdecurrent, *broad,* subventricose, *subdistant, at first dull*

purple, color subpersisting, at length cinnamon-umber, thickish, edge entire. STEM stout, 5-10 cm. long (often of medium length), 10-15 mm. thick, equal or slightly enlarged below, *firm,* solid, *sheathed by the distinct, appressed, dingy-white universal veil,* which terminates at or above the middle in an evanescent floccose-fibrillose ring, sometimes only marked by the thin subannular patches of this veil, apex violaceous or pale drab, whitish to drab within. CORTINA white, rather copious. SPORES broadly elliptical, distinctly rough-punctate, maturing slowly, 9-10.5 x 5-6.5 micr., rusty-umber in mass. BASIDIA 36-40 x 9, 4-spored. ODOR slightly of humus. TASTE mild.

Gregarious or subcaespitose. On the ground, among fallen leaves, in frondose and mixed woods. September-October. Ann Arbor, New Richmond. Rather frequent.

This species approaches *C. pulchrifolius* in possessing purple gills which remind one of *Clitocybe ochrapurpurea* except that they are not as bright as in that species. An examination of the type-specimens of *C. pulchrifolius* showed that our plant is distinct. The spores never come within the sizes of Peck's species, and the pileus has no reddish shades. The dried plants are also different. In spite of these things the two species are close together. Except for its lack of the hygrophanous flesh, and the character of the surface of the cap it also approaches *C. impennis* Fr. and *C. torvus nobilis* Pk. The universal veil is usually well-developed, but sometimes the remnants show only as thin patches on the mature stem. The purplish color of the gills is retained to late maturity. The spores mature slowly and the measurements must be made from mature plants. It must not be mistaken for either *C. torvus* Fr. nor *C. impennis* Fr.

365. Cortinarius pholideus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 761.
Quelet, in Grevillea, Vol. VII, Pl. 117, Fig. 1.
Ricken, Die Blätterpilze, Pl. 46, Fig. 4.
Plate LXXVI of this Report.

PILEUS 4-8 cm. broad, hemispherical-campanulate at first, then expanded, broadly umbonate, *surface covered by dense, innate, erect or squarrose, dark, cinnamon-brown or blackish-pointed hairy*

scales, fawn-color at first, not hygrophanous. FLESH thin, slightly violaceous, soon whitish or sordid brownish, usually infested with larvae. GILLS narrowly adnexed, medium broad, close, lilaceous at first, soon clay color to brown, edge entire. STEM 4-8 cm. long (sometimes longer), 5-12 mm. thick, spongy-stuffed and tunneled by larvae, slightly narrowed upwards, violaceous or lilac-tinged above the concentric, squarrose, brown scales which represent the sheathing universal veil. CORTINA sparse, fibrillose. SPORES oval, rough-punctate, 6-7.5 x 5-5.5 micr. BASIDIA 27 x 6 micr. ODOR and TASTE mild.

Gregarious or caespitose. In moist forests, near decaying debris or on very rotten logs, in the conifer regions of the State. Bay View, Marquette. August-September. Infrequent.

This well-marked species is probably frequent enough in its particular localities. I have collected it a number of times on much decayed wood in wet places, a preference which authors do not appear to have noticed for it elsewhere. The color varies somewhat as to the shade of brown which the veil and the pileus possess, but the characteristic scales of the cap and stem serve for easy identification. Two European species approach it closely. *C. arenatus* Fr. differs in its entire lack of violaceous hues. This has been reported in the state list, but it is probable that it was confused with a Pholiota. *C. penicillatus* is said to lack the squarrose scales, as well as the violaceous tints of the gills and flesh. *C. asper* Pk. may be only a variety of this species.

366. Cortinarius squamulosus Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustrations: Ibid, Pl. 3, Fig. 1-3.

PILEUS 4-10 cm. broad, semiglobose at first, then convex to subexpanded and broadly umbonate, surface densely appressed-tomentose at first, *soon broken up into dense, rather large, fibrillose scales,* sometimes warty on disk, brown and purplish-tinged at first, *soon chocolate-brown.* FLESH thick on disk, abruptly thin toward margin, watery-spongy, pinkish-white to grayish-white at first. GILLS adnate then deeply emarginate, rather broad, close, *purplish at first, soon dark cinnamon to chocolate-brown,* edge minutely flocculose. STEM 8-15 cm. long, stout, *swollen near the base into a large, ventricose-clavate bulb,* tapering below the bulb, 10-20 mm.

thick at apex, bulb 2 to 3 times as thick, watery-spongy within, at first purplish, *soon chocolate-brown,* sometimes subscaly, sometimes fibrillose, *annulate above by a definite band-like collar.* CORTINA pallid to brownish, closely woven. SPORES 6.5-8.5 x 6-6.5 micr., broadly elliptical to subsphoeroid, distinctly rough, dark rusty-brown in mass. BASIDIA 33 x 6 micr., 4-spored. ODOR somewhat spicy when fresh becoming strong on drying. TASTE at first mild.

Gregarious, sometimes in troops. On the ground, in low, moist, frondose woods or swamps of maple, beech, etc. Detroit, Ann Arbor. August-September. Infrequent.

Easily known by its entirely chocolate color when mature, the ventricose, pointed bulb and the band-like annulus. It absorbs water in rainy weather and becomes watery-spongy, but on drying out it takes on a tough consistency. It can scarcely be confused with any other species. Sterile outgrowths border the edge of the gills so that they appear flocculose.

367. Cortinarius erraticus Pk.

N. Y. State Mus. Rep. 42, 1889.

"PILEUS 5-7.5 cm. broad, firm, subcampanulate or convex, obtuse, dry, silky or obscurely scaly with innate fibrils, *canescent, often becoming grayish-tawny.* FLESH dingy white. GILLS adnexed, subdistant, pale tawny, becoming darker with age. STEM 5-10 cm. long, 6-12 mm. thick, firm, solid, *thickened toward the base,* white and tomentose below, *violaceous above.* UNIVERSAL VEIL *violaceous,* often forming an imperfect annulus and sometimes remaining in fragments or floccose scales on the margin of the pileus." SPORES elliptical, scarcely rough, 7.5-10 x 5-6 micr.

On the ground in groves of balsam. New York. September.

A study of the type-specimens showed that it has a universal veil, and that the spores average larger than the size given by Peck. The color of the gills when young is not certain. It would be a rather unusual relation to find the apex of the stem violaceous while the young gills are "pale tawny." For this reason, I have included it under the present section, where it probably belongs.

****Gills without violaceous or purple tints at the first.*** (Likewise pileus, flesh and stem.)

368. Cortinarius bolaris Fr,

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 760.
Gillet, Champignons de France, No. 199.
Quelet, in Grevillea, Vol. V, Pl. 79.
Ricken, Die Blätterpilze, Pl. 46, Fig. 2.
Plate LXXVII of this Report.

PILEUS 3-6 cm. broad, convex-expanded, obsoletely umbonate, *variegated by appressed, pink-red, saffron-red or cinnabar red, hairy scales* on a white ground, dry, fading, the thin incurved margin surpassing the gills. FLESH white, tinged creamy-yellow, thin. GILLS adnate, close, medium broad, distinct, pallid, *soon pale cinnamon.* STEM 5-6 cm. long, 5-10 mm. thick, tapering upward and *subequal,* stuffed then hollow, *covered like the pileus by red, fibrillose-hairy, appressed scales,* sometimes subglabrescent, *flesh becoming saffron or reddish when bruised.* CORTINA white. SPORES broadly oval to subsphoeroid, scarcely rough, 6-7 x 5-5.5 micr. BASIDIA 30 x 6 micr., 4-spored. ODOR and TASTE none. MYCELIUM red.

Gregarious or subcaespitose. In the conifer regions of the State, in mixed woods of hemlock and beech. Bay View, New Richmond. August-September. Infrequent.

This Cortinarius is known by its delicate hairy-fibrillose ornamentations on the cap and stem; these are saffron-red or darker in contrast with the whitish or yellowish flesh beneath. The cap is dry, not hygrophanous, but the fibrillose scales appear as if glued thereon. This must not be confused with *C. rubripes* which is markedly different, usually very glabrous on the pileus and much larger. The figures referred to above illustrate our plant well, except that of Ricken which emphasizes the scales and shows a stem tapering downwards. The decoration on the stem apparently represents the remnants of a universal veil.

369. Cortinarius annulatus Pk.

N. Y. State Mus. Rep. 43, 1890.

Illustrations: Ibid, Pl. 2, Figs. 1-4.
Plate LXXVIII of this Report.

PILEUS 3-9 cm. broad, broadly convex at first, then subexpanded, obtuse, dry, disk or entire surface usually *covered with innumerable, minute, pointed, erect floccose and tawny scales,* sometimes smooth, ground color, golden-tawny or tawny yellow, with a bronze lustre, margin at first incurved. FLESH thick, whitish, scarcely or not at all hygrophanous. GILLS adnate, becoming emarginate, *rather narrow,* 4-9 mm. subdistant, distinct, *at first pallid ochraceous,* then rusty-cinnamon, rather rigid, edge paler. STEM 4-8 cm. long, apex 8-15 mm. thick, *clavate,* twice as thick below, sometimes subequal, *peronate three-fourths to apex by the thin, silky-woven,* appressed, *pale tawny or yellowish universal veil,* which terminates above in an obscure ring, solid, yellowish within, whitish and fibrillose above the veil from the *white* CORTINA, base whitish, arising from a *white mycelium.* SPORES *globose,* distinctly rough, 6-7 x 5-6 micr., dark rusty-brown in microscope. ODOR of radish. TASTE mild or slightly astringent.

Gregarious, or scattered, sometimes in troops. On the ground in frondose or mixed, rich woods. August-October, usually rather early. Ann Arbor, Detroit. Not infrequent.

This species seems to represent the American form of *C. tophaceus* Fr., but the figures of that species as given by Fries, Cooke and Quelet do not remind one at all of our species. It is not easy to bring out in a figure the metallic, somewhat glittering, luster shown by a typical pileus of this plant. Ricken's figure of *C. tophaceus* comes nearer to the exact color, but he describes that species with the edge of the gills bright yellow. *C. annulatus* differs from *C. flavifolius* in the color of the universal veil and the scaly pileus. Specimens have been seen, however, in which the color of the pileus varied to ochraceous or clay-color, with brown scales. The scales, when well-developed, radiate in a star-like or bird-foot manner connecting with one another and raised in the center to a needle-like point. In the very young plant the surface of the cap is merely densely and finely tomentose, this layer connecting with the veil on the stem. Sometimes the scales are almost entirely lacking ex-

cept on the center of the disk. *C. lutescens* Pk. seems to represent the latter condition. (N. Y. State Mus. Rep. 42, 1889.)

370. Cortinarius flavifolius Pk.

N. Y. State Mus. Rep. 41, 1888.

Illustrations: Atkinson, Mushrooms, Plates 45 and 46, Figs. 152 and 153, 1900 (as *Cortinarius ochroleucus*).
Plates LXXIX, LXXX of this Report.

PILEUS 4-15 cm. broad, (usually 4-8 cm.), convex then expanded, almost plane, *creamy-buff at first,* sordid, buff to ochraceous, or pale tawny-yellowish in age, *appressed tomentose or minutely fibrillose-scaly,* sometimes only silky-tomentulose, margin at first incurved. FLESH thick, abruptly thin toward the margin, whitish, scarcely hygrophanous but moist. GILLS adnate then emarginate, *subdistant,* broad, *dull pale yellowish at first,* then *ochre-yellow,* finally yellowish-cinnamon or rusty. STEM 4-12 cm. long, *clavate or clavate-bulbous,* 6-18 mm. thick above, 15-30 mm. below, sometimes subequal, spongy-solid, *covered at first by a thin, silky-woven, appressed whitish universal veil, at length peronate* or becoming naked. CORTINA white, silky, copious, sometimes forming a rusty-stained ring above the veil. SPORES sphoeroid to oval-elliptical, minutely but distinctly rough, with an abrupt, long apiculus (as in species of Russula), 6-9 x 5-6 (incl. apiculus). BASIDIA 36-40 x 6-7 micr., 4-spored.

Gregarious. On the ground in rich humus or among fallen leaves, in frondose woods of oak, maple, etc. Throughout the State. August-October. Frequent.

A well-marked plant, often of large size and distinguished by the white universal veil which forms a very thin sheath on the stem, by the prevailing silky-tomentulose pileus and rather broad gills. It was referred by Peck to the subgenus Telamonia, but the flesh is scarcely hygrophanous, and the pileus not glabrescent. The gills are rarely "rich sulphur-yellow" as described by Peck, but the spores of the type-specimens are described above and are quite distinct. It differs from *C. annulatus* and *C. croceocolor* in the pale, delicate yellowish-white colors of cap and stem. It is apparently a native American species. *C. newfieldiensis* Ellis of the N. A. F. exsiccati No. 3052 is identical.

371. Cortinarius croceocolor Kauff.

Bull. Torr. Bot. Club, Vol. 32, 1905.

Illustrations: Ibid, Fig. 5, p. 314.
Jour. of Mycology, Vol. 13, Pl. 93, 1907.
Mycological Bull., Vol. 5, Fig. 240, p. 314, 1907.
Plate LXXXI of this Report.

PILEUS 3-7 cm. broad, convex then expanded, *saffron-yellow, with dense, minute, dark-brown, erect squamules on disk,* scarcely hygrophanous, not striate. FLESH yellowish-white, thick on disk, thin toward margin, slightly hygrophanous, scissile. GILLS cadmium-yellow, scarcely subdistant, rather thick, emarginate, rather broad, width uniform. STEM 4-8 cm. long, clavate or clavate-bulbous, 9-15 mm. thick below, *peronate three-fourths of its length by the chrome-yellow to saffron-yellow universal veil,* paler at apex, solid, saffron-colored within, soon dingy, attached to strands of yellowish mycelium. SPORES subsphoeroid to short-elliptical, 6.5-8 x 5.5-6.5 micr., echinulate.

Gregarious or solitary in mixed woods, Ithaca, N. Y. Not yet found within the borders of the State. Probably to be looked for in the north. The whole surface of the pileus has a velvety appearance and feel. The entire plant is often saffron-colored. It approaches *C. callisteus* Fr. on the one side and *C. limoneus* Fr. on the other. It was originally placed under the subgenus Telamonia, but the present characterization of Inoloma admits it here. *C. croceofolius* Pk. seems to be somewhat related, but averages much smaller and its pileus is more brown and lacks the scales, and the stem is not peronate.

372. Cortinarius ochraceous Pk.

N. Y. State Cab. Report 23, 1872.

PILEUS 5-8 cm. broad, convex, *broadly subumbonate* or gibbous, glabrous, *pale ochraceous,* even or obscurely wrinkled. FLESH thick, whitish. GILLS emarginate, rather broad, subdistant, *pallid to pale ochraceous at first,* then rusty-cinnamon. STEM 5-10 cm. long, rather stout, 8-12 mm. thick at apex, *clavate or clavate-bulbous,* bulb 20-38 mm. thick, fibrillose, ochraceous above *the white, appressed, sheath of the universal veil.* SPORES broadly elliptical, slightly rough, obtuse at ends, 9-11.5 x 6-7.5 micr.

Under balsam trees. New York. October.

The original description has been completed by a study of the type specimens and of the drawings made by Dr. Peck. The sheath on the stem is white and much as in *C. flavifolius,* but the spores are much larger.

373. Cortinarius canescens Pk.

N. Y. State Rep. 42, 1889.

"PILEUS 5-7.5 cm. broad, subcampanulate or convex, obtuse or somewhat umbonate, *silky or scaly with innate grayish fibrils, whitish gray when young,* tinged with yellow or rufous hues when old. GILLS thin, subdistant, rounded behind and adnexed, *pallid at first.* STEM 5-10 cm. long, 8-12 mm. thick, solid, *white,* equal or tapering upward from a large, soft, spongy, *clavate-thickened base, peronate and subannulate by the silky-fibrillose, white veil."* SPORES elliptical, subinequilateral, slightly rough, 10-12 x 5.5-6.5 micr. ODOR not marked. TASTE unpleasant."

Gregarious. In spruce groves. New York. September.

Peck states that it is distinct from its allies by the absence of violaceous hues in the young gills. The pileus of the dried type specimens is of a dark smoky-gray color.

374. Cortinarius squarrosus Clements

Botanical Survey of Neb., 1901.

"PILEUS 2.5-3 cm. broad, campanulate then convex, dry, subumbonate, *clothed on disk by dense, squarrose, umber scales,* fasciculate-fibrillose on the margin, pallid umber. GILLS slightly adnate, ventricose, sometimes uncinate, *fulvous to umber.* STEM 3-4 cm. long, 5 mm. thick, subequal, hollow, fibrous-fleshy, clothed with fulvous-umber, subsquarrose fibrils. CORTINA fibrillose, umber, fugacious. SPORES irregularly elliptical, smooth, 12 x 6 micr.

"Among vegetation on the ground in woods. Nebraska."

This species approaches *C. pholideus* and *C. squammulosus,* but the spores are larger and the gills are not described with any purplish tint when young. It is a rather small Inoloma.

Section II. Universal veil lacking or obsolete.

**Gills at first violaceous, purple, lilac or caesious.*

375. Cortinarius violaceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 257.
Fries, Sveriges ätlig. o. gift, Pl. 58.
Peck, N. Y. State Mus. Rep. 48, Pl. 12, 1894.
Cooke, Ill., Pl. 770 (deceptive).
Patouillard, Tab. Analyt., No. 127. (Immature.)
White, Conn. State Geol. and Nat. Hist. Surv., Bull. 15, Pl. 23.
Ricken, Die Blätterpilze, Pl. 44, Fig. 4.

PILEUS 5-12 cm. broad, convex, obtuse, subexpanded, *dry, dark violet, covered with villose, minute suberect tufts or scales,* at length metallic-shining. FLESH rather thick, varying gray to dark violet, not becoming purple when bruised. GILLS adnate, becoming sinuate or emarginate, thick, *broad, subdistant, very dark violet,* becoming ashy-cinnamon. STEM 7-12 cm. long, *long and stout,* clavate or clavate-bulbous, 10-15 mm. thick above, *dark violet,* fibrillose, spongy in the rounded bulb, violaceous within, bulb large. SPORES *large,* rough, broadly elliptical, 12-16 x 7-9 micr. (often 16-18 micr. long, then smoother and more elongated). ODOR and TASTE mild.

Solitary or scattered. Among mosses, fallen leaves and debris of conifer woods. Found only once in Michigan; Isle Royale, Lake Superior. Frequent at North Elba, Adirondack Mountains, New York. August-October.

A striking species, not to be confused with dry specimens of the viscid-capped species, such as *C. purpurascens, C. sphaerosperma,* etc. The stem is usually long as compared with these, and the cap correspondingly smaller. The peculiar metallic luster of the dry mature pileus was observed in both our native collection and in Sweden. Both also had the characteristic fine-hairy-scaly surface not easily shown in figures but approached by Fries. No photographs exist which show this character well. The abnormally large spores were present in both our own and the Swedish plants. The whole plant is at first dark deep violet with an indigo tinge. Al-

though nearly always mentioned in the "lists" of various American writers, its local or northern distribution leads me to suspect that other species have been mistaken for it. It seems to be more frequent in the east.

376. Cortinarius lilacinus Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

Illustration: Plate LXXXII of this Report.

PILEUS 5-9 cm. broad, firm, hemispherical, then convex, *minutely silky* or glabrous, *lilac-colored,* margin at first incurved. FLESH very thick on disk, compact and firm, tinged with lilac. GILLS adnexed, rounded behind, rather broad, thick, close to subdistant, sometimes transversely rivulose, *lilac at first,* then cinnamon, edge entire. STEM *stout,* 6-12 cm. long, *with a very large clavate bulb,* 15-20 mm. thick above, bulb 2-4 cm. thick, solid, compact, bulb spongy, fibrillose, lilaceous. SPORES broadly elliptical, rather obtuse, scarcely rough, 8-10 x 4.5-6.5 micr.

Gregarious. In low, moist swampy places in mixed or frondose woods. Detroit, Marquette. August-September. Infrequent.

The lilac color persists in the dried specimens. The bulb is much broader in the young plant than the unexpanded pileus. It is quite distinct from *C. alboviolaceus* in habit and stature, as well as color. The color of the pileus is like that of the European *C. traganus* Fr., and so is the general shape of the plant, but that species is quite distinct by a strong odor and by its ochre-yellow gills at the first. More slender plants have been found which apparently belong here and these are not easily distinguished from the related species such as *C. argentatus, C. obliquus,* etc., except by the color.

377. Cortinarius argentatus Fr. var.

Syst. Myc., 1821.

Illustrations: (Fries, Icones, Pl. 152, Fig. 2 of *C. camphoratus.*)
Cooke, Ill., Pl. 745 (771 of *C. camphoratus*).
Gillet, Champignons de France, No. 194.

PILEUS 5-9 cm. broad, convex to almost plane, *silvery-violaceous-whitish,* sometimes with a lilac or amethystine tinge, *dry,* beauti-

fully appressed silky, even, not umbonate. FLESH whitish or at first tinged violaceous, thick on disk, abruptly thin on margin. GILLS narrowly sinuate-adnate, narrow, *close, pale violaceous,* rarely deep violaceous at first, soon pale alutaceous-cinnamon, edge minutely eroded-crenulate. STEM 5-8 cm. long, 10-20 mm. thick, solid, subequal *above the oval-bulbous or rounded-bulbous base,* bulb sometimes subemarginate, not depressed, sometimes subobsolete, *soon silvery-violaceous-whitish,* at first somewhat deeper violet at apex, concolor within, at first subfibrillose from the *violaceous-white* CORTINA, then innately silky, not at all peronate. SPORES elliptical, slightly rough, 7-9.5 x 5-6 micr. BASIDIA 30 x 9 micr., 4-spored. ODOR mild. TASTE slight.

Solitary or scattered. On the ground in woods of white pine and beach or in low frondose woods. Detroit, New Richmond. September. Infrequent.

This seems to be intermediate between *C. argentatus* and *C. camphoratus,* and differs from both in the more abrupt bulb than is shown by the figures of those plants. On the other hand, variations occur in the same collections in which the clavate-bulbous condition is present. On several occasions single plants were found, which agreed with the others except that there was present a distinct, penetrating odor, of an earthy-radishy nature. I have here considered them all the same. The narrow gills are always close, sometimes crowded, and this distinguishes it from the preceding. The surface of the pileus is scarcely or not at all differentiated into a pellicle or other layer although a very slight viscidity develops if the plant is kept enclosed for a time in a tight receptacle. In habit, size and paler gills it differs markedly from *C. obliquus.* There is no universal veil.

378. Cortinarius obliquus Pk.

N. Y. State Mus. Bull. 54, 1902.

Illustrations: Ibid, Pl. L, Figs. 1-5.

PILEUS 3-6 cm. broad, broadly convex, subexpanded, dry, silky-fibrillose, *violaceous-white or grayish-white,* margin at first incurved. FLESH thickish on disk, concolor. GILLS adnate, thickish, *narrow, heliotrope-purple to deep lavender at first,* at length cinnamon-brown, close, obscurely transversely rivulose, edge minutely crenulate. STEM 3-6 cm. long, short and rather stout, 6-12 mm.

thick above, solid, silky-fibrillose, *whitish,* violet-tinged within and without, *equal above the abrupt, depressed-marginate, oblique bulb.* SPORES narrowly elliptical, slightly rough, 7-9.5 x 4.5-5.5 micr., rather variable. ODOR and TASTE mild.

Gregarious. On the ground in frondose or mixed woods. August-September. Detroit, New Richmond, Marquette. Infrequent.

Well marked by the white or grayish-white pileus, the deep violet or almost amethystine or heliotrope color of the young gills and the oblique, flattened bulb of the stem. It has a dry pileus, without a viscid pellicle and must not be confused with the species of the subgenus Bulbopodium. When young, the color of the gills is in sharp contrast with that of the cap and stem. *C. brevipes* Pk. (41 st. Rep. N. Y. State Mus.) cannot be placed without further study.

379. Cortinarius pulchrifolius Pk.

N. Y. State Mus. Rep. 33, 1880.

"PILEUS 5-10 cm. broad, convex or expanded, obtuse, silky-fibrillose, *whitish or reddish-gray,* the margin whitened by the veil. GILLS emarginate, *broad, subdistant, bright purple or violet-purple,* then umber. STEM 5-10 cm. long, 6-10 mm. thick, solid, *cylindrical above the clavate or oval bulb,* silky-fibrillose, white, often tinged violet, violaceous within. CORTINA copious. SPORES elliptical, rough, 10-12.5 x 6.5-7.5 micr."

Oak woods. September. New York. Rare.

"This rare species is well-marked by the peculiar color of the young gills, which resembles that of the gills of *Clitocybe ochropurpurea.*" A study of the type showed the spores to be markedly larger than in my *C. subpulchrifolius,* and without the peronate stem. I have not collected it.

380. Cortinarius rimosus Pk.

N. Y. State Mus. Rep. 48, 1896.

"PILEUS 5-10 cm. broad, firm, convex or plane, glabrous, *at first pale grayish-violaceous,* then tinged reddish-brown, the surface cracking into appressed scales or *becoming variously rimose.* FLESH whitish. GILLS emarginate, *rather broad, distant,* subventricose, *violaceous at first,* becoming brownish-ochraceous. STEM

4-8 cm. long, 8-12 mm. thick, *equal to slightly* enlarged at base, white and silky with the white veil, tinged violaceous within." SPORES elliptical, rough, obtuse at ends, 9-12 x 5.5-6.5 micr.

"Grassy ground in open places, thin woods. New York. September. A rather large and stout plant, remarkable for the tendency of the epidermis to crack in areas. The thin margin is often split." Peck considered it to be near *C. caninus* Fr. and *C. azureus* Fr., but its stout habit seems to bring it closer to this group. It must be remembered that other species often have a rimose pileus under certain weather conditions.

381. Cortinarius braendlei Pk.

Bull. Torr. Bot. Club, Vol. 32, 1905.

"PILEUS 7-12 cm. broad, firm, convex, silky, *brownish-lilac,* often varied by yellowish-brown stains, margin at first incurved and covered by the grayish-white silky cortina. FLESH lilac, especially in the young plant. GILLS adnate, slightly rounded behind, narrow, close, eroded on the edge, *grayish tinged with lilac.* STEM 5-7 cm. long, 10-15 mm. thick, stout, solid, silky-fibrillose, *bulbous,* white or whitish, bulb often pointed below. SPORES oblong-elliptic, obscurely granular, 12-15 x 7-8 micr. ODOR of radish.

"Among fallen leaves in woods. Washington, D. C. October. Sometimes the pileus loses all its lilac color and becomes wholly yellowish-brown."

383. Cortinarius rubrocinereus Pk.

N. Y. State Mus. Rep. 33, 1880.

"PILEUS 5-7 cm. broad, convex then expanded, silky-fibrillose, *reddish-cinereous.* FLESH at first violaceous. GILLS emarginate, rounded behind, subdistant, *dingy violaceous* at first, soon pale cinnamon. STEM 4-5 cm. long, 8-12 mm. thick, *short,* solid, *oval-bulbous,* silky-fibrillose, whitish tinged with violet." SPORES 8.5-11.5 (a few up to 14) x 6-7.5 micr., variable in size, broadly elliptical, obtuse at ends.

"Gregarious. On sandy soil. New York. September. Closely related to *C. pulchrifolius,* from which it is separated by its darker

colored pileus and differently colored gills. CORTINA whitish-cinereous."

383. Cortinarius clintonianus Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 2-5 cm. broad, convex to expanded, with a few appressed silky fibrils (*pale dingy brownish-tan*), more or less tinged with gray. GILLS close, moderately broad, *dull-violaceous at first,* then cinnamon. STEM 5-7 cm. long, *rather slender,* 4-6 mm. thick, tapering upward from a subclavate base, *violaceous above,* silky fibrillose. SPORES broadly elliptical to *subglobose,* rough-punctate, 7-8 x 6-7 micr."

Ground in woods. New York State. September-October. A revised description is given above, from the study of the type-specimens and the accompanying colored figures. The cap is said to be "reddish-brown," but if so, the colors of the drawing are very pale.

***Gills at first yellow, clay-yellow, or pale cinnamon.* (Becoming rusty-cinnamon or watery-cinnamon in age.)

384. Cortinarius callisteus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 153, Fig. 2.
Cooke, Ill., Pl. 774 and 864.

PILEUS 4-8 cm. broad, convex to subcampanulate, subumbonate, moist but not hygrophanous, *deep chrome-yellow to ochraceous-fulvous,* not fading, innately silky, glabrescent, margin at first incurved and silky. FLESH thick, thin on margin, whitish or tinged yellowish. GILLS adnate, subdistant, moderately broad, *yellow at first* then argillaceous to rusty-cinnamon, edge entire. STEM 4-9 cm. long, *clavate-bulbous,* 8-10 mm. thick above, 2 to 3 times as thick below, tapering upward, firm, solid, *yellow* (luteus) within and without, *streaked longtitudinally with fulvous innate fibrils.* CORTINA fugacious, sometimes adhering at first to the margin of the pileus, yellowish-white. SPORES elliptical-oval, 7-8.5 x 5-5.5 micr., rough. ODOR weak, subnitrous.

Gregarious. On the ground in mixed hemlock, pine and oak woods. Ithaca, New York. September. Rare.

This species differs from the yellow-gilled group of the preceding section in the obsolete or absent sheath on the stem. Ricken has described and figured a species under this name with a minutely squarrose-scaly pileus and a differently shaped stem. Our plant seems to fit the Friesian species more closely than his, and the spores agree with those of specimens from Stockholm. Its colors and shapely form make it an attractive species. It does not appear to occur often. The colors become deeper in age.

385. Cortinarius autumnalis Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustration: Hard, Mushrooms, Fig. 236, p. 294, 1908.

"PILEUS 5-9 cm. broad, convex to expanded, *dull rusty-yellow*, variegated or streaked with innate ferruginous fibrils. GILLS moderately broad, close, with a wide, shallow emargination, *at length rusty-yellow*. STEM 6-10 cm. long, 10-12 mm. thick, *equal above the oval bulb,* pale rusty-yellow, solid, firm. FLESH white." SPORES elliptical, slightly rough, 7.5-9 x 4-5 micr.

"Pine woods. Bethlehem, Pennsylvania. November."

This is a somewhat confusing species. Including the type, I have seen specimens from several sources so named, but have not been able to refer any of my collections to it. The description as given by Peck is incomplete and although I have amended it so far as the type-specimens and an accompanying drawing permits, it remains uncertain as to the color of the young gills. The specimens of Peck show that it changes markedly towards rusty colors in age. The photograph of Hard represents a plant which appears familiar but as he omits a description of his own no certainty can be felt about it.

386. Cortinarius catskillensis Pk.

N. Y. State Cab. Rep. 23, 1872.

"PILEUS 5-8 cm. broad, convex or subcampanulate, then subexpanded, even, *grayish-drab,* (pale ferruginous?) variegated with minute, scattered white fibrils. GILLS deeply emarginate, close to subdistant, rather broad, *watery cinnamon at first,* becoming darker with age. STEM 6-9 cm. long, 10-20 mm. thick,

stout, solid, fibrillose, whitish, *clavate-bulbous,* tapering upward." SPORES narrowly elliptical, somewhat pointed at one end, 7-8 x 4-4.5 micr.

On the ground in open places. Catskill Mountains, New York. October.

The colored drawing accompanying the type-specimens shows a stout, clavate-bulbous plant with a grayish-drab pileus. Dr. Peck told me the pileus never had any reddish hues and the original description of a "pale ferruginous" pileus also is not borne out by the appearance of the dried specimens. A plant, apparently intermediate between this and the preceding occurs in Michigan. *Cortinarius robustus* Pk. belongs under this division but like that of the preceding two species, the description is insufficient.

387. Cortinarius whitei Pk.

Bull. Torr. Bot. Club, Vol. 29, p. 560, 1902.

"PILEUS 6-12 cm. broad, hemispherical at first, then nearly plane, with a lobed, wavy or irregular margin, dry, glabrous, *subpruinose, reddish or brownish-orange,* verging to tawny. GILLS deeply and broadly emarginate, subdistant, reddish-brown (?) at first, then brownish-cinnamon. STEM 7-12 cm. long, 15-20 mm. thick, *long, equal,* solid, fibrous, colored like the pileus, adorned with darker, fibrous lines or striations. SPORES subglobose, 7-8 x 7 micr.

"Woods. Mt. Desert Island, Maine. August.

"A large species, intermediate between Dermocybe and Telamonia, related to the former by its dry pileus, to the latter by its general aspect and stout, solid stem." It is placed here for want of necessary additional data on its development. Specimens at the New York Botanical Garden have every appearance of belonging to Telamonia.

****Gills at first white or whitish.*

388. Cortinarius cæspitosus Pk.

N. Y. State Mus. Rep. 42, 1889.

"PILEUS 5-10 cm. broad, firm, convex, often irregular from its crowded mode of growth, *pale yellow or buff,* a little darker on disk,

margin silky-fibrillose. FLESH *white.* GILLS adnexed, rounded behind, thin, close, rather broad, whitish at first, then subochraceous. STEM 3-7 cm. long, 8-12 mm. thick, subequal above, *with a clavate-bulbous base,* silky-fibrillose, floccose-villose at apex, subannulate, *white."* SPORES narrowly elliptical, *pale,* smooth, 8-9.5 x 4-4.5 micr.

"Mossy ground in open places. Catskill Mountains, New York. The *caespitose* mode of growth, yellowish pileus, pale gills and white flesh distinguish the species."

389. Cortinarius modestus Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 2-4 cm. broad, convex to expanded, subfibrillose, even or slightly rugulose-wrinkled, *alutaceous.* FLESH white. GILLS close adnexed, moderately broad, nearly plane, *pallid at first,* then cinnamon. STEM 5 cm. long, 4 mm. thick above, clavate-bulbous, subfibrillose, hollow or stuffed with white pith, concolor." SPORES broadly elliptical, 7-8.5 x 5-6 micr.

"Ground in woods, New York. September. Distinguished from *C. clintonianus* by its paler color, more bulbous stem and entire absence of the violaceous tinge of the gills." An examination of specimens on the sheets with the type, showed that several of the larger specimens had different spores and could not belong there. It is sometimes caespitose. In size it approaches the Dermocybes, and appears to be close to *C. albidifolius* Pk. In a letter, preserved at the New York Botanical Garden, Peck states that it is near *C. intrusus* but has different spores.

390. Cortinarius gracilis Pk.

N. Y. State Mus. Bull. 2, 1887.

PILEUS 1.5-4 cm. broad (occasionally up to 7 cm.), *conical at first* and Roods brown (Ridg.) then campanulate and margin decurved, *with a prominent subacute umbo,* pinkish-cinnamon to *light vinaceous-cinnamon* (Ridg.) when drying, subhygrophanous, even, glabrescent, margin at first incurved and white-cortinate, elsewhere *silky-shining* with innate white fibrils. FLESH very thin except on center, concolor. GILLS adnate then emarginate, moderately broad, close, pallid at first, *soon cinnamon* to cinnamon-brown (Ridg.), edge at length crenulate-eroded. STEM 5-15 cm. long, *elon-*

gated, thickness variable, usually 4-8 mm. thick (rarely up to 15 mm.), *cylindrical,* sometimes tapering upward, at length flexuous, *solid,* white fibrillose-silky, *soon pallid* or tinged fuscous, concolor within, glabrescent. CORTINA white, persistent, rarely forming an evanescent ring. SPORES elliptical, 10-11.5 x 6 micr., smooth, pale ochraceous under the microscope. ODOR and TASTE mild.

Solitary, scattered, rarely subcaespitose, deeply imbedded at base of stem *in sphagnum and mosses* in balsam and tamarack swamps. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Frequent.

Variable in size of cap and thickness of stem but very distinct from all other Cortinarii. The pale colors, the conic-campanulate cap, the sphagnum habitat and the spores distinguish it. The type specimens in Peck's herbarium appear to have been specimens of small size. Only the young rapidly developing plants show the hygrophanous character well; they soon fade. Although the species is quite frequent in the swamps, I never saw a well-developed annulus nor definite signs of a universal veil, so that it appears to be intermediate between Telemonia and Inoloma. Occasionally the stem is subclavate below. The gills are not dark at first in good specimens and Peck may have had young, dry weather forms in which the gills sometimes become dark prematurely. It would be remarkable to find the young gills "ferruginous-brown" as described by Peck, in plants colored like this one.

SUBGENUS DERMOCYBE: Pileus and stem *neither viscid nor hygrophanous.* Pileus innately silky at first, glabrescent, flesh thin. STEM *equal* or *attenuated toward apex,* stuffed to hollow, at length slender, rather rigid or exterior. Universal veil rarely present.

Composed of medium-sized or small, rather slender-stemmed and often elegantly colored plants. The cortina is fibrillose, usually of the same color as the pileus. Fries says "easily distinct from the Inolomas by the thinness and substance of the pileus and by the stem." Several species, however, approach the subgenus Inoloma closely, especially those Dermocybes included under my first section. The stem of the species of Dermocybe is at length equal or attenuated and this character combined with the small size and the lack of distinct scales on the pileus, separates them from the subgenus Inoloma. The absence of a truly hygrophanous pileus distinguishes them from the subgenus Hydrocybe, which they simulate in size. Some of the species are quite variable and many intermediate forms

occur, some of which have been given names, especially the forms near *C. cinnamomeus.*

Section I. Universal veil more or less manifest, evanescent.

**Gills at first violaceous or purplish.*

391. Cortinarius caninus Fr.

Syst. Myc., 1821.

Illustrations: Ricken, Die Blätterpilze, Pl. 46, Fig. 5.
Marshall, The Mushroom Book, Pl. 31, op. p. 85, 1905.

"PILEUS 6-10 cm. broad *violaceous-fulvous, soon beautifully rusty-fulvous* to almost orange-fulvous, *micaceous-glistening,* often almost zoned on margin by the remains of the veil, sometimes scaly-cracked, campanulate-convex, obtuse, thin, compact on disk. FLESH pallid, tinged lilac. GILLS *lilac-clay color at first,* soon watery-cinnamon, at length cinnamon-fulvous, emarginate, *broad, subdistant.* STEM 7-10 cm. long, 10-20 mm. thick, *pallid,* at length rusty-fibrillose, narrowed upwards, elastic, stuffed then hollow, at first almost girdled by a pallid veil. SPORES globose, 8-9 x 7-8 micr. BASIDIA 30 x 9-10 micr. ODOR and TASTE mild."

The description is adapted from Ricken. It has been reported several times from this country but I have never recognized it. Except in size it seems to approach some of the forms of *C. anomalus* closely. Saccardo and Stevenson give slightly longer spores. Miss Marshall's plant had a disagreeable odor.

392. Cortinarius anomalus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 154, Fig. 2.
Cooke, Ill., Pl. 776. (Pl. 850 as *C. lepidopus* Cke.)
Gillet, Champignons de France, No. 192 (as var. *proteus*).
Ricken, Die Blätterpilze, Pl. 47, Fig. 1.

PILEUS 2-5 cm. broad, hemispherical-convex then sub-expanded, obtuse, even, *covered when young* by an interwoven appressed *gray silkiness, becoming pale fulvous-alutaceous when expanded,* sometimes tinged at first with a violaceous-grayish tinge, at length glisten-

ing with a micaceous sheen. FLESH thin, dark grayish-violet at first, *soon pallid,* not truly hygrophanous. GILLS adnate at first becoming sinuate-emarginate, *not broad,* close, *at first caesious, violet or grayish-purplish,* then alutaceous-brown, edge lacerate-crenulate. STEM at first clavate and 10-18 mm. thick, then elongated and slender, 5-10 mm. thick, 4-9 cm. long, *spongy-stuffed, at first violet,* soon dingy pallid, or only the apex violaceous-tinged, gray-violet within, when fresh dotted with dingy ochraceous to yellowish scales, *glabrescent* or fibrillose, soon infested with larvae, elastic on drying. SPORES almost spherical, rough-punctate, 7-9 x 6-7 micr. BASIDIA 34 x 7 micr., 4-spored. ODOR and TASTE mild.

Gregarious. On moist debris and humus, mosses, etc., in beech and hemlock woods. New Richmond. September. Infrequently found, probably not uncommon in the north.

This agrees exactly with the species around Stockholm, where I first saw it. It is sometimes variable especially as to shades of color and the presence or absence of the dingy yellowish remnants of an evanescent universal veil. When mature these little patches on the stem are scarcely visible. In the fully developed condition the violaceous colors have almost or entirely disappeared from the gills and stem. The flesh is moist or shot through with watery streaks when fresh but it is not truly hygrophanous. *C. deceptivus* Kauff. is very close, but is truly hygrophanous and the color is at first deeper. *C. lepidopus* Cke. is apparently also one of its forms. *Cortinarius simulans* Pk. (N. Y. State Mus. Bull. 2, 1887) is another closely allied species and perhaps identical.

393. Cortinarius spilomeus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 154, Fig. 3.
Ricken, Die Blätterpilze, Pl. 47, Fig. 2.

"PILEUS 2-5 cm. broad, convex to expanded, *fuscescent, rufescent or argillaceous,* gibbous, dry, glabrescent, fading. FLESH rather thin. GILLS emarginate or adnate, crowded, thin, narrow, *caesious or violaceous at first,* at length watery cinnamon, edge very entire. STEM 4-9 cm. long, 6-12 mm. thick, subequal, stuffed to hollow, whitish, tinged lilac or violaceous at first, *variegated by reddish or fulvous, delicately appressed subconcentric scales.*

"Very elegant. The stem is colored similarly to that of *C. bolaris,*

but subequal and the cortina is white." In *C. bolaris* no violet is present in the young plant. The flesh of the cap is thin.

The above is adapted from the descriptions of Fries, especially from that in the Icones, where elegant figures are to be found. Peck has reported it from New York and it is desirable to get data of its distribution in America. It seems to be very rare. The size of the spores is not agreed upon by European writers. Ricken says they are 6 x 5 micr., while Saccardo and Stevenson give them 8-9 x 7-8 micr. One collection from Sault Ste. Marie seems to belong here but the reddish color was not nearly as intense as in Fries' figure.

Section II. Universal veil obsolete or lacking.

**Gills at first whitish or pallid, or tinged slightly with violaceous or grayish.*

394. Cortinarius subtabularis sp. nov.

PILEUS 2-6 cm. broad, campanulate-convex at first, *then plane* or obsoletely umbonate, *discoid, dry, caesious or violaceous-drab* to silvery-fuscous, *silky-shining with white silky fibrils,* even. FLESH thin, soon *pallid.* GILLS adnate then sinuate, rather broad, close but distinct, ventricose, *at first pallid with obscure violaceous tints,* at length cinnamon, never truly violet or purplish, edge entire. STEM 3-5 cm. long, 4-6 mm. thick, *equal except a slight, subabrupt, bulbillate* base, apex slightly scurfy, *pale violaceous-drab,* color persistent, silky-fibrillose and shining, sometimes marked at the base by the remnants of the *white* CORTINA, stuffed, hollowed by larvae, usually strict, later flexuous or curved. SPORES elliptical, scarcely rough, 9-10 x 5 micr. BASIDIA 30 x 7 micr. ODOR none or slight. TASTE mild.

Scattered or gregarious. On the ground among or under fallen leaves of oak and maple woods. Ann Arbor. October-November. Frequent locally.

Characterized by the peculiar, small, abrupt bulblet of the stem and the "erythrinus" or subviolaceous color when fresh. The cap often becomes a little darker or stained in age, while the color of the stem is more apt to persist. It has the stature of an Inocybe. The young gills are scarcely of the "violet" type. It seems to approach *C. tabularis* Fr. and its size and the nature of the cap are

fairly well shown by Cooke (Ill., Pl. 783), differing however in the shape of the stem and in color. Old dried specimens sometimes do have the color shown by Cooke's figure. It was found frequently in the region between Ann Arbor and Detroit.

395. Cortinarius brevissimus Pk.

N. Y. State Mus. Rep. 41, 1888.

"PILEUS 1.5-2.5 cm. broad, convex, often irregular, at first minutely silky, then glabrous, *dingy-white to argillaceous.* FLESH whitish. GILLS adnexed, close, *at first pale violaceous* then whitish to cinnamon. STEM *very short,* 1-1.5 cm. long, 6-8 mm. thick, equal, *hollow,* silky-fibrillose, *white,* pale violaceous within. SPORES broadly elliptical, 6-7.5 x 5-6 micr.

"Thin woods. Catskill Mountains, New York. September. Related to *C. brevipes* Pk., but smaller, with a hollow stem and shorter spores."

396. Cortinarius abidifolius Pk.

N. Y. State Mus. Rep. 41, 1888.

"PILEUS 3-5 cm. broad, convex, subglabrous, *whitish tinged with yellow or pale ochraceous,* the epidermis sometimes cracking and forming scales. FLESH thin, whitish. GILLS adnate, emarginate, subdistant, *whitish at first,* then cinnamon. STEM 5-8 cm. long, 4-8 mm. thick, equal or slightly enlarged at base, solid, *white but variegated with yellowish, floccose scales below,* silky-fibrillose above. Spores subglobose, 6-7.5 x 5-6 micr.

"Woods. Catskill Mountains, New York. September."

Closely related to this, if not the same, is a species occurring about Ann Arbor. It differs mainly in its slightly larger size and stouter stem; the shred-like appressed scales of the stem are dingy, not yellowish and the spores are slightly larger, subsphoeroid, 7-9 micr. The cuticle of the pileus is composed of differentiated, narrow, horizontal hyphae, subgelatinous, but scarcely subviscid in moist weather. Its dimensions are as follows: pileus 3-7 cm. broad, stem 5-7 cm. long, 5-12 mm. thick. Both forms differ from *C. ochroleucus* Fr. in the stem being enlarged toward the base and in the scale-like remnants of a universal veil. It should probably be included in the preceding section. It is possible that this is var. (B)

of *C. ochroleucus,* mentioned in "Monographia," p. 57, which is compared with *C. sebaceoides* as to stature and shown as an almost white plant in Fries' figure at the Stockholm Museum.

397. Cortinarius ochroleucus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 775.
Quelet, in Grevillea, Vol. V, Pl. 85, Fig. 1.

"PILEUS 4-5 cm. broad, convex, gibbous and *obtuse,* even, glabrous or minutely silky, *pallid-white.* FLESH firm, white. GILLS broader behind, adnexed, then seceding, *crowded, whitish at first* then argillaceous-ochraceous. STEM 5-7 cm. long, 8-12 mm. thick, solid, firm, *ventricose, white, naked,* except apex which is fibrillose from the cortina." SPORES (8 x 4-5 micr. Massee) rarely given. "ODOR none. TASTE *bitterish.*"

The description given above has been adapted from Fries' "Monographia" and "Hymen. Europ." The species is occasionally reported from this country and is not well understood, not even in Europe if we may take the meager notes into account. The figures referred to have too much of an ochraceous color to agree with descriptions. It seems to be rare as Fries has indicated, and its medium size, ventricose or downward-tapering stem and bitterish taste distinguish it from any American plants I have studied.

398. Cortinarius sericipes Pk.

N. Y. State Mus. Rep. 33, 1880.

"PILEUS 1-2.5 cm. broad, conical to subcampanulate, glabrous, *chestnut color,* often darker on umbo. GILLS ascending or ventricose, narrowed behind, *broad, close, whitish at first,* then tawny to tawny cinnamon, white on edge. STEM 2-7 cm. long, *slender,* 2-4 mm. thick, equal, hollow, silky-fibrillose, slightly mealy at apex, shining, *white.*" SPORES almond-shaped, *large,* rough, 15-16 x 8-9 micr., ventricose, somewhat pointed at ends.

"Damp ground in woods. New York. October."

The type-specimens indicate a slender plant with the Inocybe habit. The spores were found to be narrower than given by Peck. The stem seems to have been subannulate by a white silky zone.

399. Cortinarius castanellus Pk.

N. Y. State Mus. Rep. 29, 1878.

PILEUS 1-2.5 cm. broad, convex then expanded, *umbonate,* innately silky, shining, glabrous, even, *dark cinnamon to chestnut color,* umbo blackish, streaked blackish when old. FLESH thin, pallid. GILLS adnate and rounded behind, then emarginate, close, moderately broad, pallid, *soon cinnamon-brown.* STEM 4-5 cm. long, 2-4 mm. thick, *slender,* equal or attenuated downwards, *dingy white then tinged fuscous,* stuffed then hollow, glabrescent. SPORES elliptical, rough, 7-9 x 4.5-6 micr.

Gregarious or subcaespitose. On bare ground "in open fields" and borders of lakes. Ann Arbor. (Whitmore Lake.) October. Infrequent.

In color it resembles *C. nigrellus* Pk. but that species is almost twice as large, with a distinct universal veil and smaller spores. It is a slender plant, reminding one of the Hydrocybes.

400. Cortinarius basalis Pk.

N. Y. State Mus. Rep. 33, 1880.

"PILEUS 1-2 cm. broad, convex then expanded, *hairy, tawny,* FLESH thin. GILLS subventricose, *pale tawny at first,* cinnamon when old. STEM 2-2.5 cm. long, 5-6 mm. thick, short, hollow, fibrillose, pallid or pale tawny, usually with a slight, webby annulus below the middle of the stem." SPORES elliptical, smooth, 7-8.5 x 3-4 micr., pale under the microscope.

"Naked soil in woods. New York. *Caespitose,* September."

This seems to approach *C. impolitus* in its hairy pileus and in size and color, but that species has larger spores, hygrophanous pileus, shorter stem and grows in coniferous woods. The plants are small and tufted. It probably has pallid gills when very young since the change of color indicated by the description is very unusual.

****Gills at first yellowish, red or cinnamon.* (Usually elegant plants.)

401. Cortinarius cinnamomeus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 777.
Gillet, Champignons de France, No. 204.
Michael, Führer f. Pilzfreunde, II, No. 70.
Ricken, Die Blätterpilze, Pl. 47, Fig. 6.
Hard, Mushrooms, Fig. 239, p. 298, 1908.
Peck, N. Y. State Mus. Rep. 48, Pl. 13, Fig. 7-14.

PILEUS 2-4.5 cm. broad, campanulate-convex, obtuse or subumbonate, umbo often vanishing, *yellowish-cinnamon, yellowish-tawny,* etc., silky or minutely and densely scaly *from the innate or appressed, yellowish fibrils, shining.* FLESH pale citron or straw-yellow, rarely deep-yellow, thin. GILLS adnate, varying to adnexed-emarginate or scarcely subdecurrent, rather *broad,* close (not truly crowded), *cadmium-yellow, citron-yellow or cinnamon-yellow,* shining. STEM 3-8 cm. long, 3-6 mm. thick, *equal,* often flexuous, *chrome to citron yellow when fresh,* darker when handled, fibrillose, stuffed, *becoming tubular,* olive-cinnamon-yellow within, *attached to a yellow mycelium.* CORTINA citron-yellow, fibrillose. SPORES short elliptical, smooth, 6-7.5 x 4-4.5 micr. (few 8 x 5 micr.) BASIDIA 24 x 6 micr., 4-spored. ODOR and TASTE mild.

Gregarious or subcaespitose. On moist rich ground, very decayed wood or mosses, in conifer regions, in sphagnum swamps, or more rarely in frondose woods. Throughout the State, Marquette, New Richmond, Ann Arbor, etc. August-October. Infrequent.

This species is usually marked "common" by the writers of books or lists; a statement which is correct enough if *C. semisanguineus* and its forms are included. The segregated plant as described above even with its variations is rarely common according to my experience in Michigan and about Ithaca and North Elba, New York. It may be more common in special localities. It is quite variable and Fries says "innumerable forms have been set up by authors." The colors and shape vary with the habitat, so that sphagnum forms, e. g., have longer stems and shaded pilei deeper colors. The spores of the American plant seem to be slightly smaller than in those reported by Saccardo, Massee, Ricken, etc., and in

Swedish specimens collected by myself. These have spores measuring 7-8.5 x 4-5.5 micr. The following species seems closely related but differs in the spore-character.

402. Cortinarius cinnamomeus Fr. var.

Illustration: Cooke, Ill., Pl. 778 (as *C. cinamomeus* var.).

PILEUS 2-6 cm. broad, campanulate or subhemispherical, obtuse or discoid, umbonate, regular at first, then wavy-margined, *olivaceous-cinnamon-brown, tinged rufous* on disk, innately and minutely fibrillose-scaly or silky, edge incurved. FLESH yellowish-white, rather fragile. GILLS adnate, *narrow,* close to crowded, cadmium-yellow with olivaceous tint, thin, eroded-crenulate on edge. STEM 5-9 cm. long, 4-7 mm. thick, *slightly enlarged below* and tapering upward, fibrillose-striate, pale yellow, olivaceous-tinged, becoming tubular, yellowish-olivaceous within. CORTINA yellow, fibrillose. SPORES elliptical, smooth, 7-9 x 4-5 micr. ODOR and TASTE mild.

Gregarious. Among mosses in a sphagnum swamp. Bay View, Ann Arbor. August-September. Infrequent.

Differs from *C. cinnamomeus* in the rufous cast on the pileus, the narrow gills, subclavate stem and slightly longer spores. It is well represented by the figure of Cooke cited above. Variety *croceus* is smaller, gills less crowded, gills and stem *tinged olivaceous.* (See Cooke, Ill., Pl. 780.)

403. Cortinarius croceoconus Fr.

Monographia, 1851.

PILEUS 1-3 cm. broad, *obtusely conico-campanulate,* umbo persisting, firm, *rufous-fulvous to fulvous-cinnamon,* silky, *dry,* even, subshining, margin incurved. FLESH whitish, tinged red at the upper surface, yellowish toward stem, thick at umbo, thin elsewhere. GILLS adnate then somewhat seceding, ascending, rather narrow, close, *pale yellow at first, then cinnamon,* opaque, edge minutely eroded. STEM elongated, 5-12 cm. long, 3-5 mm. thick, *equal, flexuous,* fibrillose with rufous-fulvous fibrils, *yellowish within,* elastic, stuffed then tubular. CORTINA pale rufous-fulvous, becoming pallid, subfibrillose. SPORES elliptical, almost smooth, 8-9.5 x 5 micr.

Gregarious or subcaespitose. On low, mossy ground of pine, poplar, etc., near Stockholm, Sweden. September, 1907.

This species has been reported at various times in America. The figures of Cooke (Ill., Pl. 780) and of Gillet (No. 210, Champignons de France) are, however, very misleading. The above description was made from plants which I collected near Stockholm. It seems probable to me that errors have been made in referring plants to this species and that a full description at this place of what is undoubtedly the Friesian plant is desirable.

404. Cortinarius luteus Pk.

N. Y. State Mus. Rep. 43, 1890.

"PILEUS 2-5 cm. broad, conical or convex, unpolished, *yellow,* often darker on disk. FLESH yellow. GILLS adnexed, yellow, *subdistant,* moderately broad. STEM equal, 5-10 cm. long, 10-20 mm. thick, *stout, solid* (!), silky-fibrillose, *yellow.* SPORES subglobose or broadly elliptical, 7.5 x 6-7 micr.

"Mossy woods. New York. July."

This seems to be closely related to the preceding, but the stem is stouter and the type-specimens show the gills to be subdistant and rather broad. The spores are also somewhat different.

405. Cortinarius aureifolius Pk.

N. Y. State Mus. Rep. 38, 1885.

PILEUS 1-4 cm. broad, convex-campanulate, then plane, *cinnamon-brown* or darker, dry, densely fibrillose-tomentose, sometimes scaly, especially on disk. FLESH thin, yellowish brown or pallid. GILLS adnate, subventricose, *broad,* close, thin, *yellow then ferruginous-cinnamon.* STEM 3-6 cm. long, 3-6 mm. thick, subequal, rather short, solid, fibrillose, *yellow,* brown within. SPORES 10-12.5 x 5 micr., *oblong,* smooth, ochraceous-cinnamon in mass. ODOR of *radish.* TASTE mild.

"Sandy soil, in thin pine woods." New York, Massachusetts. October. Specimens sent to me from Massachusetts were apparently this species except that they had more slender stems than the type. As Peck has already pointed out, the species reminds one of an Inocybe and the peculiar oblong spores are further evidence of such a position for it. It seems to be rare and needs more study.

406. Cortinarius croceofolius Pk.

N. Y. State Mus. Bull. 150, 1911.

Illustrations: Ibid, Pl. VI, Fig. 1-8.

"PILEUS 2.5-5 cm. broad, broadly convex or nearly plane, obtuse or obtusely umbonate, dry, *slightly fibrillose* especially on the margin, *brownish-cinnamon*, often paler or saffron-yellow on the margin. FLESH thin, pale yellow, grayish or dingy when dry. GILLS thin, close, *saffron-yellow verging to orange at first,* then brownish-cinnamon, often yellow, crenulate on margin. STEM 2.5-4 cm. long, equal or slightly thickened at the base, fibrillose above, *saffron-yellow,* hollow. CORTINA concolor. SPORES broadly ellipsoid, 6-7 x 4-5 micr.

"Mossy ground on the borders or in woods of spruce and balsam fir. New York. September."

This approaches *C. cinnamomeus* in some of its forms except that the gills are more deeply colored.

407. Cortinarius malicorius Fr.

Epicrisis, 1836-38.

Illustration: Fries, Icones, Pl. 155, Fig. 1.

PILEUS 2-6 cm. broad, obtusely convex to subexpanded, *fulvous or tawny-fulvous,* tinged golden yellow, *silky-tomentose,* subzonate in age. FLESH *intensely olivaceous* when fresh, scissile, thick on disk. GILLS sinuate or adnate-subdecurrent, close, not broad, *rusty-yellow then dark golden-fulvous.* STEM 5-7 cm. long, 6-12 mm. thick, equal or subequal, *becoming hollow,* fibrillose from the *orange-fulvous cortina,* tinged olivaceous, *soon yellow-fulvous,* or reddish-stained, *olivaceous within.* SPORES short elliptical, slightly rough, 6-7 x 4-4.5 micr. ODOR and TASTE mild.

Gregarious. Under hemlock and cedar in swampy woods. Sault Ste. Marie. August. Rare.

The Michigan plants had all the characters attributed to the species by Fries. The flesh of the growing plant is distinctive. In the pileus it is intensely olivaceous to greenish, bordered by a narrow zone of yellow or fulvous next to the surface; in the stem the axis soon breaks down leaving a tubular cavity, the rest of the flesh being yellowish-olivaceous, bordered by the narrow, yellow cuticular zone

which is well shown in Fries' figures. There is a tendency for the cap and stem to become stained dark reddish in age. Ricken has changed the description somewhat as to the color of the young gills. In our plants, however, they were not olive-yellow although such a variation is to be expected where the flesh has that color. Ricken also gives spore-measurements which are too large for those of my collection. A variety of *C. cinnamomeus* was found under white pine and beech at New Richmond, which was fulvous on the cap and stem and with a slight olive tinge on the gills. A series of intermediate forms between this and *C. cinnamomeus* seems to exist.

408. Cortinarius semisanguineus Fr.

Syst. Myc., 1821 (as var. of *C. cinnamomeus*).

Illustrations: Cooke, Ill., Pl. 779.
Gillet, Champignons de France, No. 250.
Atkinson, Mushrooms, Fig. 151, p. 162, 1900.
White, Conn. State Geol. & Nat. Hist. Surv., Bull. 3, Plate 20, 1905.
Peck, N. Y. State Mus. Rep. 48, Pl. 13, Fig. 15-20, 1896.

PILEUS 2-6 cm. broad, campanulate-convex, subumbonate, (varying to conic-campanulate or broadly hemispherical, often at length expanded and split on margin) *tawny-yellow to cinnamon-yellow,* silky or delicately fibrillose-scaly, sometimes shining-zoned. FLESH dingy yellowish-white, rather firm. GILLS adnate-subdecurrent, *narrow, crowded, cinnabar or blood-red.* STEM 3-6 cm. long (longer on sphagnum), 3-6 mm. thick, equal or subequal, solid-fibrous, chrome to citron-yellow, fibrillose from the *yellow or tawny-yellow* CORTINA, elastic. SPORES elliptical, smooth, 5-7 x 3-4 micr. BASIDIA 24 x 6 micr., 4-spored. ODOR and TASTE mild.

Gregarious or subcaespitose. In low moist swamps, sphagnum, etc. Throughout the State. August-October. Frequent.

Usually considered a variety of *C. cinnamomeus.* There are some forms which could be called varieties of this in turn. This shows that in the present group we have what is well known to exist in the higher plants, namely, an innumerable number of very closely related species, or varieties, or forms, or any other term which expresses difference. For convenience we group a larger or smaller number of these "different" but almost like forms together and call them species. As details accumulate it is easier to keep the details in

mind if we make several species from an old group of one species. Hence varieties are raised to the rank of species, and forms to the rank of variety, etc. This method is not used by the theoretical biologist but is very useful for practical every day arrangements for study. The above species is easily distinguished as such in the majority of cases hence it is now kept distinct. In order to produce fundamental proof that *C. cinnamomeus* and *C. semisanguineus* are one and the same species, absolutely expressed, it would be necessary to grow one kind from spores derived from the other kind.

409. Cortinarius cinnabarinus Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 154, Fig. 4.
Gillet, Champignons de France, No. 203.
Patouillard, Tab. Analyt., No. 647.
Quelet, in Grevillea, Vol. VII, Pl. 110, Fig. 4.
Ricken, Die Blätterpilze, Pl. 47, Fig. 5.

PILEUS 3-6 cm. broad, campanulate, umbonate, sometimes plane, innately *silky-shining, bright cinnabar-red,* dry, even or rimose, sometimes split on margin. FLESH pallid-reddish, fading. GILLS adnate, then emarginate, *rather broad,* ventricose, subdistant, *cinnabar-red* then dark rusty-red, velvety-shimmering, edge entire. STEM 2-5 cm. long, 4-8 mm. thick, equal or tapering upward, *cinnabar-red,* shining, stuffed then hollow, fibrous, fibrillose. CORTINA concolor. SPORES elliptical, slightly rough-punctate, 7-9 x 4.5-5.5 micr. BASIDIA 36 x 7, 4-spored.

Gregarious or scattered. On the ground, in frondose woods, almost exclusively *in oak woods.* Throughout the State; Marquette, Ann Arbor, New Richmond, etc. July-August. Frequent (rare September and October).

This is one of the early Cortinarii of the season. It frequents rocky or hilly oak woods and in this respect shows a preference which is different from that of the same species in Europe where it is said by Ricken and Fries to occur almost exclusively in beech woods. As data from beech woods in this country are lacking this may also be true here but not so far as my own observation extends. This preference might seem to indicate a mycorhizal connection with the oak roots, but so far every examination showed that the reddish mycelium merely vegetates in the leaves and humus.

The species is quite distinct from the preceding ones inasmuch as every part is at first cinnabar-red. This color is dissolved out by a weak solution of caustic potash; and this is also true of *C. semisanguineus* and even of some of the preceding species in which the red color is otherwise obscured. The nearest approach to it is *C. sanguineus* Fr., which I collected near Stockholm and in the Adirondack Mountains.

409b. Cortinarius sanguineus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 786.
Gillet, Champignons de France, No. 246.

PILEUS 2-4 cm. broad, obtuse, or umbonate, campanulate, dry, innately silky or minutely scaly, opaque, *dark blood-red.* FLESH blood-red, thin on margin. GILLS adnate, rather broad, close, dark blood-red. STEM 5-10 cm. long, 3-7 mm. thick, elongated in moss, equal or tapering, stuffed then hollow, *relatively slender,* blood-red, darker where bruised. CORTINA fibrillose, tinged red. SPORES narrow-elliptical, 7-8 x 4-5 micr., tinged red, roughish. ODOR mild; TASTE slightly like radish.

Gregarious in deep moss or sphagnum in conifer woods.

Isle Royale, Sault Ste. Marie, etc., mostly in the northern part of the State. Infrequent.

Distinguished from *C. cinnabarinus* by its habitat, its longer stem and more blood-red color. European authors do not emphasize the mossy habitat, but with us this seems to be the usual place of growth.

The color of every part of this species is dark blood-red, the pileus is silky-scaly and not as broad as that of *C. cinnabarinus*, the stem is more slender and usually longer; the spores are similar. It grows on thick moss or sphagnum under conifers. Ricken gives measurements which are too large for the Swedish plant. Peck's specimens, reported in the 23d Report, are doubtless *C. cinnabarinus.*

*****Gills at first greenish or olivaceous.*

410. Cortinarius raphanoides Fr. var.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 833 (typical).

PILEUS 1.5-4 cm. broad, campanulate-convex, *obtuse,* then subexpanded and subumbonate, not striate, *densely innately fibrillose-hairy,* unicolorous, *light brownish olive* (Ridg.), scarcely shining, margin decurved. FLESH thin except disk, concolor, fading. GILLS adnate then emarginate, close, rather broad, *at first chrysolite-green* (Ridg.), then darker, thickish, edge entire. STEM 7-10 cm. long, 3-5 mm. thick, *equal,* stuffed then hollow, *olivaceous,* concolor within, fibrillose, mycelioid at base and attached to sphagnum. CORTINA olivaceous. SPORES 8-9 x 5-6 micr., oval-elliptical, slightly rough. ODOR and TASTE *mild* or slight.

Gregarious-scattered on sphagnum moss in balsam and tamarack swamps. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Rare.

The typical *C. raphanoides* is said to have a strong radish odor and acrid taste. These were lacking in our plants, and only in some respects is it very close to that species. Its sphagnum habitat in conifer woods also seems to point to a distinct species. It differs from *C. valgus* in its fibrillose hairy pileus and stature. No such plant is described from the United States. There are no violaceous hues present.

SUBGENUS TELAMONIA. Pileus *hygrophanous,* its color changing on losing moisture, not viscid, glabrous or *sprinkled on the margin with the superficial fibrils of the universal veil;* flesh relatively thin, scissile. Stem *peronate or annulate* from the remains of a universal veil.

This and the following subgenus are closely related by the hygrophanous character of the pileus, by which they are both separated from the subgenera Inoloma and Dermocybe. To quote Ricken: "By 'hygrophanous' we designate a pileus whose surface is not compact but composed of loose tissue which absorbs water readily and when soaked with moisture has quite a different color than when dried out. After several experiences this peculiarity is recognized at the first glance. If one is uncertain about it, the plants collected in dry weather are placed in a dish of water," and then allowed to dry

again. The presence of a universal veil separates this subgenus from Hydrocybe. This veil is composed of a thin, woven, slightly membranous texture and extends from the base of the stem in the young plant over the marginal portion of the pileus. On its inner surface it is continuous with the *cortina,* at least part way. As the plant expands the veil collapses, sometimes adhering to the stem in the form of a sheath (peronate) sometimes leaving only remnants along the stem and often indicating its presence by delicate superficial fibrils on or toward the margin of the pileus. Since the cortina itself, when copious, may leave a slight ring on the stem of those species which belong to the subgenus Hydrocybe, one has to become familiar with the characteristics of the two veils—universal veil and cortina—in order to refer a species properly. This subgenus includes a number of large species, but many others are of medium to small size. The Michigan species of this group are not yet very well studied and a number of collections belonging here are for the present omitted. For this reason the following arrangement must be considered temporary.

Section I. Plants wholly or in part with violet, purplish or ashy hues.

411. Cortinarius torvus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 157.
Cooke, Ill., Pl. 801.
Gillet, Champignons de France, No. 251.
In Grevillea, Vol. VII, Pl. 117, Fig. 2.
Ricken, Die Blätterpilze, Pl. 49, Fig. 6.
Plate LXXXIII of this Report.

PILEUS 4-6 cm. broad (rarely broader), broadly convex to plane, obtuse or subumbonate, firm, *subhygrophanous, violaceous-fulvous, purplish-brown or copper-brown at first,* at length paler, disk rusty-fulvous, *covered with a hoary frostiness,* sometimes furfuraceous-scaly, at length glabrous, sometimes radiately wrinkled, often punctate. FLESH at first dull grayish-purple at length brownish or pallid. GILLS at first adnate, then emarginate-adnexed, *broad, subdistant,* thickish, subrigid, *dark or dull purplish at first,* then dark cinnamon-umber. STEM 4-7 cm. long (sometimes longer), 7-8 mm. thick above, *clavate-bulbous,* tapering upward, bulb 12-16

mm. thick, *peronate* to or above the middle by the whitish, universal veil, which terminates above in a flaring, membranous ring, *dull violaceous and silky above the veil, spongy-solid.* SPORES 8-11 x 4.5-6 micr., ventricose-elliptical, rough-tuberculate, *maturing slowly,* rusty-umber in mass. BASIDIA 36 x 6-7 micr. ODOR at first slight, *sweet-aromatic* after crushing the flesh. TASTE mild.

Gregarious or subcaespitose. Among humus and decayed debris in frondose or pine woods. Houghton, New Richmond, Detroit. August-September. Infrequent.

Well marked by the peculiar, though variable color, broad gills and the membranous, annular-terminated sheath of the stem. The young plants have a very bulbous stem which becomes clavate-elongated. Two forms occur as to the shape of the stem, a short-stemmed, stocky, bulbous form and a long-stemmed one in which the bulb has almost disappeared; the former seems to be more frequent and is shown by the figure in Grevillea and by our own plate. The figure in Fries' Icones represents much larger specimens than usually occur with us. Maire points out (Bull. d. l. Soc. Myc. de France, Vol. 26, p. 27) that it is distinguished from the European *C. impennis* Fr. by its membranous annulus. The stem is often curved at the swollen base and is sometimes ventricose. Its odor reminds one of faintly aromatic substances. The spores may easily be given too small since they mature slowly. Ricken says they measure 8-9 x 5-6 micr. Peck has a variety *"nobilis,"* which may be a distinct species; it needs further study.

412. Cortinarius plumiger Fr.

Epicrisis, 1836-38.

PILEUS 5-12 cm. broad, firm, campanulate, rarely conical-campanulate, obtuse or subumbonate, expanded, *densely appressed, fibrillose-tomentose or fibrillose-hairy,* hygrophanous, fading, sepia-brown at first then light pinkish-cinnamon (Ridg.), margin often decorated by narrow shreds of the universal veil. FLESH thick on disk, thin toward margin, pallid brownish (moist) soon faded. GILLS adnate then emarginate, close, *rather broad,* pallid at first, rarely faintly tinged caesious-violaceous, then *clay color* to mikado-brown (Ridg.), edge subcrenulate or entire. STEM 5-10 cm. long, 10-18 mm. thick above, clavate-bulbous, *stout,* at length subcylindrical above, spongy within but firm, *very fibrillose, grayish-blue-violet* (Ridg.) when fresh, quickly fading, concolor within, at length

pallid or dingy. CORTINA whitish, thin. UNIVERSAL VEIL white at first, leaving thin subannular shreds or a slight annulus on the lower part of stem, soon sordid brownish. SPORES elliptical, slightly rough, 8-10 x 5-6 micr., pale ochraceous under microscope. ODOR and TASTE slight.

Gregarious. Bulb imbedded in wet moss and soil under spruce and balsam trees. North Elba, Adirondack Mountains, New York. August-September, 1914. Collection Kauffman. Frequent locally.

Well marked by the dense tomentosity of the cap when young and by the pallid gills. Even under the most favorable conditions the violet-bluish tint of other parts than the stem was scarcely noticeable. It agrees well with the Friesian description, but is not the plant of Quelet (Grevillea, Vol. 7, Pl. 112, Fig. 1), nor that of Ricken. At times the hygrophanous character is deceptive as the cap becomes darker with age. The universal veil is thin in small plants and the species could be looked for under Inoloma. It differs from *C. canescens* by its spores and by the violaceous stem when young. It is possible that *C. catskillensis* is a dry weather form of this species.

413. Cortinarius evernius Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 866.
Ricken, Die Blätterpilze, Pl. 49, Fig. 2.
Hard, Mushrooms, Fig. 246, p. 305, 1908.

PILEUS 3-10 cm. broad, *fragile, conico-campanulate*, prominently umbonate when expanded, *hygrophanous*, sometimes irregular or gibbous, *purple-fuscous to brownish-vinaceous* (Ridg.), faded and silky in dry weather, margin soon wavy, at first incurved and silky from the veil, glabrescent. FLESH thin, concolor or violaceous when moist. GILLS emarginate, adnate, thickish, *broad, rather distant*, ventricose, *at first violaceous-purple* then cinnamon-brown, edge whitish. STEM 10-15 cm. long (rarely 15-20 cm.), 8-20 mm. thick, *cylindrical or attenuated toward base*, sometimes flexuous, *pale lavender to deep violet*, more deeply colored at the base, *marked by annular shreds* of the *violaceous then whitish universal veil* over most of the surface, spongy and solid, concolor within. SPORES elliptical, slightly rough, 8-9.5 (rarely 10) x 5-6 micr. ODOR slightly of radish. CORTINA fibrillose, whitish, evanescent.

Gregarious or subcaespitose. On moss, decayed debris and humus

in coniferous woods. Bay View, Marquette and North Elba, New York. August-September. Infrequent—almost rare.

Known by its elongated stem, which is usually rather stout and tapering at the base; the young, conical pileus is scarcely wider than the stem. It differs from related species in the shape of the pileus. In dry weather the color is often pale violaceous, shading to lavender and when old the pileus is likely to be split on the margin. The violaceous universal veil collapses and forms thin and adnate annular patches above the stem, scarcely ever forming a membranous annulus as in *C. umidicola.* The description of our plants differs somewhat from the European descriptions in the differently shaped spores and stem although Fries says the stem is sometimes attenuated below. The unpublished plate of Fries at the Stockholm Museum shows a much deeper violet color than the figures of Cooke. The inconsistency of the spore-sizes and spore shapes of European authors indicates that the species is not clearly understood. Fries states that the stem has the characteristics of *C. elatior* Fr., but, except for its mode of development, this is not strikingly apparent in our plants. When deeply imbedded in moss the stems are very long.

414. Cortinarius umidicola Kauff.

Bull. Torr. Bot. Club, Vol. 22, 1905.

Illustrations: Ibid, Fig. 4, p. 312.
Jour. of Mycology, Vol. 13, Pl. 94, 1907.
Mycological Bull., Vol. V, Fig. 239, 1907.

PILEUS 5-10 cm. broad, (rarely up to 14 cm.), hemispherical then convex-expanded, firm, *hygrophanous, dull heliotrope-purplish at the very first,* soon umber and glabrous on disk, *fading to pinkish-buff* and covered with innate, whitish, silky fibrils, *punctate,* margin persistently incurved and decorated by narrow, whitish, transverse strips from the universal veil. FLESH lavender when young, soon faded to sordid whitish, thick on disk, abruptly thin on margin. GILLS emarginate with tooth, very broad, plane then ventricose, subdistant, thick, *at first lavender,* soon pale-tan to cinnamon, edge subserratulate, concolor. STEM 6-10 cm. long, (rarely 10-13 cm.), 10-20 mm. thick, subequal, usually thickened below, sometimes narrowed below or curved, always *stout,* solid, *lavender above the woven, sordid white universal veil* which at first covers the lower part as a sheath, but soon breaks up so as to leave a

band-like annulus half-way or lower on the stem, or forming adnate patches, concolorous, lavender within and soon cavernous from grubs. CORTINA violaceous-white. SPORES elliptic-ovate, slightly rough, 7-9 x 5-6 micr. BASIDIA 40 micr. long.

Gregarious, often in troops or partial rings. In wet, swampy places, frondose or mixed woods. Marquette, Houghton, Detroit. July-September. Infrequent.

This species is probably identical with one occurring in Europe. I collected a very similar plant, with the same gregarious habit, near Stockholm, Sweden, while in company with Romell, Maire and Peltereux, who did not recognize it as a species definitely known to them. It had the same spores, and all the characters of the American plant except the less marked lavender color. I suspect it is *C. lucorum* Fr. Two other collections from Sweden brought to this country and labeled *C. impennis* Fr., the one determined by Robert Fries with spores like *C. umidicola,* the other determined by Romell, with spores measuring 11-12 x 6-7 micr., seem to show that two similar species are being confused in Europe. One of these corresponds to *C. umidicola,* and is well illustrated by Gillet (Champignons de France, No. 228), the other is the true *C. impennis* Fr. (Icones, Pl. 157, Fig. 2). If this inference is correct, then Ricken's description of *C. impennis* also applies to the former species. The taste of the plants which I collected in Sweden was like ours, not of radish. The unpublished plate of *C. lucorum* Fr. in the museum at Stockholm represents a plant very much like *C. umidicola* with several band-like rings on the stem. Cooke's figure (Pl. 1192, Ill.) seems to belong elsewhere.

415. Cortinarius scutulatus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 158.
Cooke, Ill., Pl. 820.
Gillet, Champignons de France, No. 249.
Ricken, Die Blätterpilze, Pl. 49, Fig. 1.

PILEUS 2-4 cm. broad, at first subhemispherical and sometimes gibbous, then campanulate, firm, *brittle,* hygrophanous, *dark-purplish-chestnut or smoky-violet-umber,* unicolorous, becoming canescent with grayish-white innate fibrils, inflexed margin at first silky. FLESH concolor under cuticle, soon whitish elsewhere.

GILLS adnate then emarginate, rather broad, *subdistant,* thickish and rigid, *at first pale smoky-purple* then dark rusty-umber. STEM 3-7 cm. long, 4-10 mm. thick, *equal* or subattenuate below, *rather stout,* sometimes slender, rigid, thinly *peronate at first by the grayish-white or purple-tinged universal veil,* soon subannulate by the breaking up of the veil, at length silky-fibrillose, solid. CORTINA whitish. SPORES short elliptical, almost smooth, 7-8 x 4-4.5 micr. BASIDIA 30 x 7 micr., 4-spored. ODOR none.

Gregarious. On open sandy soil under poplar. New Richmond. September. Rare.

I have referred this collection here with some hesitation. The plants are well illustrated by the figures of Gillet and Ricken. The illustrations of Fries are apparently from selected and perfect plants such as are more common in the moist climate of Sweden than in that of our State. The description given above applies to plants entirely different from any other species of the group by their peculiar colors, the brittle flesh and the habitat. It differs most from the European descriptions in the absence of the radishy odor. It seems to have some relationship with *C. sciophyllus* Fr., but the spores of that species, according to Battaile (Bull. d. l. Soc. Myc. de France, Vol. 26, p. 336), measure 8-9 x 6-8 micr.

416. Cortinarius deceptivus Kauff.

Bull. Torr. Bot. Club, Vol. 32, 1905.

Illustrations: Ibid, Fig. 7, p. 324.
Plate LXXXIV of this Report.

PILEUS 2-7 cm. broad, suborbicular to hemispherical, becoming convex-campanulate, *subhygrophanous, fawn-colored tinged with lavender,* fading to light tan, disk alutaceous-buff, covered with minute, brownish scales when young, becoming glabrous, rugulose in age. FLESH thin except on disk, rather spongy, *lavender when young,* then pallid or sordid tan. GILLS 3-5 mm. broad, thick, moderately close, adnate, emarginate, narrowed in front, *lavender at first,* pale tan when old. STEM 3-6 cm. long, rather stout and clavate at first, then elongated and slender, solid, *at first covered by the thick, fibrillose universal veil, which is lavender,* soon fading to whitish, at length remaining as oblique, fugacious, brownish scales or partial rings, terminating above in the cortina. SPORES

7-9.5 x 6-7 micr., subsphoeroid to broadly elliptical, rough. ODOR mild.

Gregarious. On moist humus or debris in hemlock or mixed woods. Ann Arbor, Marquette, Bay View, etc. August-October. Frequent.

This species is close to *C. anomalus* Fr., indeed it may be considered as a hygrophanous form of that species. The group to which it belongs is composed of a number of closely related species, unless one considers the fluctuating variation of the one species as quite extensive. The colors of this species are much deeper violet or lavender at first than in the typical *C. anomalus* and the flesh is distinctly hygrophanous. Nearly all these related plants (see *C. anomalus*) have a punctate pileus.

417. Cortinarius adustus Pk.

N. Y. State Mus. Rep. 42, 1889.

"PILEUS 2-3.5 cm. broad, broadly campanulate or convex, obtuse, *hygrophanous, bay-brown when moist* sometimes canescent on the margin, paler when dry, smoky-brown with age and generally rimose-scaly. FLESH yellowish-gray. GILLS subfree, rather thick, distant, *purplish-brown.* STEM 2-8 cm. long, 6-10 mm. thick, *equal,* stuffed or hollow, fibrillose, brownish with a white mycelioid coating at the base, colored within like the flesh of the pileus." SPORES broadly elliptical, 8-10 x 5.5-6.5 micr.

"Subcaespitose. In balsam groves. New York. September."

The dried type-specimens are blackish-brown, showing a rather stout stem and small pileus. It seems closely related to the next.

418. Cortinarius griseus Pk.

N. Y. State Mus. Rep. 41, 1888.

"PILEUS 2-7.5 cm. broad, convex, obtuse or gibbous, fibrillose-scaly with grayish hairs or fibrils, pale gray when moist. GILLS adnexed, subdistant, *at first pallid then* brownish-ochraceous. STEM 5-7 cm. long, 6-12 mm. thick, tapering from *a thickened or bulbous base,* silky-fibrillose, whitish." SPORES broadly elliptical, obtuse, 10-12 x 6-7 micr.

"Mossy ground under balsam trees. New York. September.

"The fibrils of the pileus are similar to those of *C. paleaceus,* but

the plant is much larger and stouter and the spores are larger. It is well marked by its grayish color." The color of the young gills distinguishes it from *C. adustus* and *C. scutulatus*. It seems to approach *C. canescens* in all its characters except the lack of a peronate stem.

419. Cortinarius subflexipes Pk.

N. Y. State Mus. Rep. 41, 1888.

PILEUS 1-2 cm. broad, *conical* then campanulate and subacutely umbonate, glabrous, *hygrophanous, blackish-brown* and the thin margin incurved and whitened by the veil *when moist,* subochraceous when dry. FLESH concolor, thin. GILLS adnexed, thin, close, rather broad, ventricose, *at first clay-color tinged violaceous* then cinnamon. STEM 3-6 cm. long, 2-4 mm. thick, equal, *slender,* flexuous, silky-shining, violaceous within, subannulate by the whitish universal veil, *pale violaceous when young,* especially above the annulus, pallid or reddish when old. SPORES narrow elliptical, scarcely rough, 6-7.5 x 3.5-4 micr.

Thin woods. North Elba, Adirondack Mountains and Catskill Mountains, New York. September.

Hardly related to *C. flexipes,* from which Peck separated it because of its more glabrous pileus and different gills. It has the stature of *C. fuscoviolaceus.*

420. Cortinarius flexipes Fr. minor

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 49, Fig. 4.
Quelet, Grevillea, Vol. VIII, Pl. 113, Fig. 3.

PILEUS 1-3 cm. broad, at first conical then *conic-campanulate,* hygrophanous, ground-color cinnamon-brown, *densely covered with shining grayish-white subagglutinate fibrillose scales* up to the apex of the *acute umbo,* scales small, superficial and easily rubbed off. FLESH at the very first violaceous, soon pallid or brownish. GILLS adnate-emarginate, *at first or when moist walnut-brown* (Ridg.) *with a purplish tint,* soon sudan-brown (Ridg.), broad, close to subdistant, edge entire, at first whitish. STEM 3.5-5 cm. long, 2-4 mm. thick, at first strict then flexuous, stuffed then hollow, dark violaceous at apex, soon grayish-brown, *annulate by a distinct*

white annulus above the middle, concentrically subannulate below with white flecks, at first violet within. SPORES elliptical, pale, 7-7.5 x 4-5 micr., slightly rough, pale ochraceous. ODOR and TASTE none.

Gregarious. In low swamps under spruce in moss. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Infrequent.

This is a pretty plant. When fresh the general effect of the pileus is that of a scaly-capped smoky-gray or drab-gray Inocybe. The universal veil leaves a well-marked annulus. The species seems to be taller and slightly larger in Sweden according to Fries. The pileus is more densely fibrillose than that of *C. paleaceus* from which it differs also in the dark-colored gills when young. The figure of *C. paleaceus* in Icones (Pl. 160, Fig. 4) is an exact reproduction of the size, shape and habit of our form of *C. flexipes.*

Section II. Universal veil red, tawny, cinnamon or yellow.

421. Cortinarius rubripes Kauff.

Rep. Mich. Acad. of Sci., 1906.

Illustrations: Bot. Gaz., Vol. 42, 1906.
Jour. of Mycol., Vol. 13, Pl. 100, 1907.

PILEUS 5-12 cm. broad, convex-campanulate then expanded, hygrophanous, *watery-cinnamon when moist, or tinged rufous,* obtuse or subumbonate, more or less ferruginous-stained, fading to pinkish-ochraceous, in zones from the umbo outward, at length with innate, silky-shining fibrils, sometimes wavy and irregular, *glabrescent,* even. FLESH thin except on disk, scissile, with a rufous tinge. GILLS *subdistant,* distinct, rather rigid, adnate, seceding in age, often with hoary fibrils at point of attachment to stem, *pale cinereous-purple or rufous-tinged at first,* soon reddish-cinnamon, edge entire. STEM 5-7.5 cm. long, with an oval or clavate bulb, 5-15 mm. thick at apex, *bulb deep brick-red to vermillion,* paler upwards, elastic, spongy-stuffed within, *glabrous, except for the fibrillose remains of the thin, evanescent, pale reddish, universal veil.* SPORES elliptical, smooth, granular within, 8-9 x 4-5 micr. BASIDIA 30-35 x 7 micr., 4-spored. MYCELIUM *brick-red* and sometimes forming mycorhiza on roots of forest trees.

Gregarious or subcaespitose. On the ground in frondose woods. July-September. Ann Arbor. Frequent locally.

Well marked by the tinge of brick-red which pervades the whole plant on drying and shades into a deep red towards the base of the stem. The hygrophanous character is unmistakable. The universal veil is not always manifest. This species approaches the European *C. bulliardi* Fr. and *C. colus* Fr. From the former it is to be separated by the hygrophanous pileus and the spores. It is, however, uncertain what the spore-size of the Friesian plant really is. Ricken refers a plant to *C. bulliardi* whose spores measure 6-7 x 3-4 micr., "spindle-almond-shaped." Others give larger spores, and apparently deal with a different species. Boudier (Icones), gives a figure of *C. bulliardi* which resembles our plant closely. *C. colus* Fr. appears to differ in the absence of the universal veil and, according to Ricken, in the slightly larger spores, and its gills are without any purplish tint. It is similar in its "fiery-red" mycelium, and general aspect (see Pl. 50, Fig. 6, Die Blätterpilze). To add to the confusion, Peck described a species sent to him under the name *C. rubripes* Pk. (N. Y. State Mus. Bull. 105, 1906), which he says is related to *C. cinnabarinus*. It has violaceous gills when young, a grayish-ferruginous to pale alutaceous pileus, and bright red stem. The spores measure 7.5-10 x 5 micr. It is a smaller plant than any of the others mentioned. For the present our plant must be considered a distinct species.

422. Cortinarius armillatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 158.
Cooke, Ill., Pl. 802.
Gillet, Champignons de France, No. 197.
Ricken, Die Blätterpilze, Pl. 48, Fig. 5.
Michael, Führer f. Pilzfreunde, II, No. 71.
Marshall, Mushroom Book, Pl. 32, p. 86, 1905.
Hard, Mushrooms, Fig. 243, p. 301, 1908.
Plates LXXXV, LXXXVI of this Report.

PILEUS 5-12 cm. broad, campanulate with decurved margin, then expanded, not truly *hygrophanous, tawny rufescent to red-brick color,* moist when fresh, innately fibrillose or minutely scaly, with shreds of the universal veil often clinging to the margin, sometimes glabrescent. FLESH rather spongy, not very thick considering its size, dingy pallid. GILLS adnate, sometimes sinuate and un-

cinate, *broad,* distant, *pale cinnamon at first, then dark* rusty-brown. STEM 7-14 cm long, *clavate or elongated-bulbous,* 10-20 mm. thick at apex, up to 35 mm. thick below, solid, firm, fibrillose, brownish or pale tawny-rufescent, *encircled by several cinnabar-red zones or bands from the rather membranous red universal veil.* CORTINA at first whitish, collapsing, and forming a slight annulus colored by the spores. MYCELIUM whitish. SPORES elliptical, rough-tuberculate, 10-12 x 5-6.5 micr. BASIDIA 35 x 8 micr., with long, slender sterigmata. ODOR more or less of radish. TASTE mild.

Solitary or gregarious. On thick humus, debris, very rotten wood, etc., in the coniferous forests of northern Michigan. Isle Royale, Huron Mountains, Marquette, Bay View. July-September. Frequent.

A noble species. It is the chief of this group, as already noted by Fries. The 2-4 reddish bands, scattered along the stem, mark it conspicuously. Its large size and tawny-rufescent color help to distinguish it readily from others of the subgenus. The lack of the hygrophanous character and the rather scaly pileus at times ally it to the Inolomas with which it is more easily confused, but the texture of the pileus and its general characteristics show it to belong to the subgenus Telamonia. I have not seen it in the southern part of the State, although it probably occurs wherever hemlock trees and other conifers are native. Some consider *C. haematochelis* Fr., which has a single red zone on the stem, as identical.

423. Cortinarius morrisii Pk.

Bull. Torr. Bot. Club, Vol. 32, 1905.

PILEUS 3-10 cm. broad, convex then campanulate-expanded, *hygrophanous,* wavy or irregular on the margin, *dark ochraceous or tawny-ochraceous,* covered with minute, silky fibrils, radially rugose at times. Flesh thin except on disk, *yellowish.* GILLS adnate then emarginate-adnexed, rounded behind, *broad,* subdistant, yellow at first, then rusty-cinnamon, edge eroded. STEM 6-10 cm. long, *equal or subequal,* 8-20 mm. thick, stout, solid, fibrous-fleshy, *yellow within,* whitish or pale yellow above, *yellow to ochraceous* and becoming ferruginous to blackish-umber below, *imperfectly annulate by adnate shreds of the yellowish universal veil.* SPORES oval or broadly-elliptic, slightly rough, with an oil-globule, 7-9 x 5.5-6 micr., (rarely up to 10 x 7). ODOR weak, of radish.

"Moist shaded woods, under hemlock trees. Massachusetts. August-October."

The above description was made from specimens sent to me by G. E. Morris in whose honor Peck named it. The yellow color of the flesh, and the tendency of the cap and stem to become rusty in age is a marked characteristic. The caps of dried specimens are blackish-umber-brown. I have not seen it in Michigan.

424. Cortinarius mammosus sp. nov.

PILEUS 2-8 cm. broad (mostly 4-6 cm.), *conico-campanulate at first*, then expanded and obtusely *umbonate, hygrophanous,* fawn-color to brownish-cinnamon, scarcely tinged with olivaceous, subferruginous on umbo when dry, *beautifully silky-shining,* glabrescent. FLESH thin except on disk, concolor when moist, pallid when dry. GILLS adnate, becoming emarginate, subventricose, medium broad, close to somewhat subdistant, *at first pallid with tinge of fawn-color*, then pale cinnamon-umber, edge even. STEM 5-9 cm. long, tapering upward from a subclavate base or almost equal, 5-8 mm. thick above, pale brownish, paler above, *subannulate or with thin, concentric, fawn-colored zones from the universal veil,* sometimes abruptly pointed below, stuffed. SPORES 7-8.5 x 5-6 micr., broadly elliptical, slightly rough, obtuse.

Among mosses and debris of a sphagnum swamp. Gregarious. Chelsea (near Ann Arbor), Michigan. September. Rare.

Differs from the similar species in the Dermocybe group, of which *C. cinnamomeus* is the center, in its hygrophanous flesh, lack of yellowish gills and habit, as well as by the presence of the universal veil. In this last respect it approaches *C. sublanatus* Fr. and *C. valgus* Fr. (sense of Cooke), but is much more slender. The umbo is very obtuse and well-developed from the first, and the gills are not yellow nor saffron at any stage.

425. Cortinarius paludosus Pk.

N. Y. State Mus. Rep. 43, 1890.

"PILEUS 2-4 cm. broad, conical or convex, *ferruginous when moist,* buff-yellow or pale ochraceous when dry, hygrophanous. FLESH yellowish. GILLS broad, subdistant, adnate, saffron-yellow. STEM 5-8 cm. long, about 4 mm. thick, equal, long, flexuous,

solid, *peronate and sub-annulate by the fibrillose yellow universal veil.* SPORES 7.5-9 x 5 micr.

"Mossy ground in swamps, New York. August."

Section III. Universal veil white or whitish.

**Gills at first yellowish or pallid-ochraceous.*

426. Cortinarius hinnuleus Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 805.
Gillet, Champignons de France, No. 227.
Patouillard, Tab. Analyt., No. 648.
Ricken, Die Blätterpilze, Pl. 48, Fig. 3.

PILEUS 3-6 cm. broad, campanulate at first, then expanded and recurved, subumbonate, *rusty-ochraceous or yellowish tawny,* variegated with rusty stains in age, very *hygrophanous,* paler when dry, glabrous. FLESH thin, watery-soft, fragile when fresh. GILLS adnate-emarginate, *broad,* subdistant, pale yellowish-fulvous at first, stained rusty in age, edge minutely lacerate. STEM 5-7 cm. long, 4-7 mm. thick, rather slender, unequal, *soft and fragile,* easily split longitudinally, stuffed, *curved,* yellowish-pallid becoming dingy, glabrescent, *cingulate when fresh by a white zone* about the middle. SPORES broadly elliptical, scarcely rough, 7-9.5 x 5-6 micr. BASIDIA 30 x 7 micr., 4-spored. ODOR none.

On the ground among decayed debris, in beech and pine woods. New Richmond. September. Infrequent.

This plant seems to be very close to the European one, but differs in some minor particulars. It is more yellowish on the pileus, quite fragile and the gills are less broad and distant. It is placed here provisionally. At maturity the watery-rusty stains on the cap give it a spotted appearance; its flesh is thin and at length splits radially. The stem is variously thickened or almost equal, soft and usually curved. The white band-like zone on the stem at length disappears.

427. Cortinarius castaneoides Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustration: Ibid, Pl. 4, Fig. 10-15.

PILEUS 1-2 cm. broad, campanulate-convex, then expanded, *chestnut-brown to dark watery-cinnamon,* brownish-ochraceous when dry, subumbonate and usually darker on center, *hygrophanous,* scarcely silky with a few superficial fibrils, even, margin sometimes whitish from the veil. FLESH *thin*, watery-brownish then pallid. GILLS adnate then emarginate, *rather broad*, subdistant, yellowish at first, then yellowish-cinnamon to dark cinnamon, edge almost entire. STEM 2-5 cm. long, 1.5-3 mm. thick, equal, slender, stuffed then hollow, subflexuous, pallid, *annulate from the cortina and the fugacious universal veil which remains as subannular, delicate shreds on the stem below.* SPORES elliptical, smooth, 6-7.5 x 3.5-4.5 micr. ODOR and TASTE none.

Gregarious or subcaespitose. On the ground in low frondose or conifer woods or in mossy places. Ann Arbor, New Richmond, Marquette, etc. August-October. Infrequent.

This has the stature and spores of *C. subflexipes* Pk., but the pileus is more convex, and the gills and stem not at first with any violet tint. *C. badius* Pk. is also of about the same size, but its spores are almost twice as large as those of *C. castaneoides.* These three approach the slender species of the subgenus Hydrocybe, and cannot always be distinguished easily from that group, especially where the annulus or other evidence of the universal veil have disappeared. *C. decipiens* Fr. differs in its conic pileus, different spore-size and the tint of rufous present on the stem.

428. Cortinarius badius Pk.

N. Y. State Mus. Rep. 41, 1888.

Illustration: Plate LXXXVII of this Report.

"PILEUS 1-2.5 cm. broad, varying conical to campanulate-convex, umbonate, *hygrophanous, blackish-chestnut-color when moist,* bay-red or chestnut when dry, sometimes tinged gray, the umbo darker, usually whitish-silky on the margin when young. FLESH concolor when moist, thin. GILLS *broad*, subdistant, ventricose, adnexed, *at first yellowish or cream-color,* then subochraceous. STEM 2-4 cm.

long, about 2 mm. thick, slender, equal, hollow, *silky-fibrillose and subannulate by the whitish veil, concolor within and without.*" SPORES large, broadly elliptical, 11-12.5 x 6.5-7.5 micr., scarcely rough.

"Mossy ground. Catskill Mountains, New York. September.

"The species is related to *C. nigrellus,* from which it differs in its broad gills which are paler in the young plant and in its larger spores." The Michigan collections formerly referred here differ somewhat and are described below, the gills are at first whitish or pallid.

***Gills at first whitish or pallid.*

429. Cortinarius iliopodius Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 839 (form).

PILEUS 2-3 cm. broad, campanulate-subexpanded, mammillate, hygrophanous, *sorghum-brown* (Ridg.), *with blackish umbo when moist,* avellanus (Ridg.) when dry, and then canescent-fibrillose and silky shining, margin at first incurved and white-silky from the veil. FLESH brownish (moist), thin, scissile. GILLS *pallid at first* then cinnamon (Ridg.), adnate, rounded behind, ventricose, *rather broad,* thin, close to subdistant. STEM *slender,* elongated, 5-9 cm. long, 3-4 mm. thick, *equal,* stuffed, at length flexuous, decorated by the delicate white silky remnants of the veil, pale incarnate, *fuscescent,* fuscous-brown or ochraceous toward base within, cortex subcartilaginous. SPORES elliptical-almond shaped, slightly rough, 10-12 x 5-6.5 micr., pale yellowish-cinnamon. ODOR and TASTE mild.

Scattered-gregarious on sphagnum swamp of spruce and tamarack. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Infrequent.

It soon fades to the colors of *C. paleaceus,* with a slight drab tint. It differs from *C. paleaceus* in its scattered mode of growth, in its sphagnum habitat and especially in its large spores. In shape and size it imitates *C. decipiens,* but is usually more slender. The species as conceived by Fries is evidently very variable and the plant described above is a definite form. In Monographia, Fries speaks of the yellow flesh of the interior of the stem. In Systema, he says the stem is occasionally fuscous, lilaceous, etc. In the plates at the

Stockholm Museum there is a "rubellus" tint to the stem and gills but otherwise the figures would represent the Adirondack specimens well.

430. Cortinarius badius Pk. var.

Differs from the type in the *gills becoming at first whitish,* stem whitish, pileus watery cinnamon to bay-brown when moist, fading *to ochraceous or pale tan, obtuse.* The spores measure 10-12 x 6-7 micr., elliptical, scarcely rough, cinnamon-brown in mass.

On mossy ground, frondose woods. Ann Arbor. May and October. Infrequent.

This little plant approaches *C. badius* quite closely in the size of the spores, and by neglecting the colors, was formerly referred to it. It needs further study. *C. punctata* Fr. (sense of Ricken) differs in its darker-colored stem and gills.

431. Cortinarius impolitus sp. nov.

PILEUS 8-20 mm. broad, *small,* firm, conic-campanulate then expanded, obsoletely umbonate, obtuse, *minutely fibrillose-scaly,* fibrils often dense at first, *hygrophanous, umber to chestnut-cinnamon at first,* becoming pale fawn or sometimes rufous-ochraceous, silky on the decurved margin, even. FLESH thin, concolor. GILLS adnate, *relatively broad,* sub-distant, thickish, *at first whitish or pallid* then cinnamon, edge entire. STEM 2-2.5 cm. long, 1-3 mm. thick, slender, equal, stuffed, *brownish or fuscescent, annulate about the middle* by a floccose, subpersistent, whitish ring, silky fibrillose, *cortina* dingy whitish. SPORES narrow subfusiform, subacute at ends, 9-10 x 4-4.5 micr., smooth. BASIDIA 27 x 7 micr. ODOR and TASTE none.

Gregarious or subcaespitose. On sandy soil among mosses in low, moist places in white pine and beech woods. New Richmond. September-October. Rather frequent locally.

A small species, marked by the median, subpersistent annulus, the dense, minute fibrils on the pileus and by the color and the spores. The annulus may appear below the middle or rarely be absent altogether; in the latter case faint whitish zones mark the stem. It seems to be partial to sandy regions.

***Gills at first brownish or fuscous.*

432. Cortinarius brunneofulvus Fr.

Epicrisis, 1836-38.

Illustration: Ricken, Die Blätterpilze, Pl. 50, Fig. 4 (as *C. brunneus* Fr.).

PILEUS 3-7 cm. broad, convex, hygrophanous, *dark watery-brown,* glabrous, even, subvirgate on drying, *margin white from the veil,* decurved. FLESH concolor when moist, thick on disk, scissile. GILLS adnate then sinuate, distinct, thickish, broad, subdistant, *soon brown to dark umber-cinnamon.*. STEM 5-8 cm. long, 10-15 mm. thick, *narrower upwards* from a clavate or bulbous base, solid, brown, longitudinally streaked with paler fibrils, *annulate by a distinct whitish band at or below the middle,* from the whitish, universal veil. SPORES elliptical, distinctly tuberculate, 10-12 x 6-7 micr. ODOR and TASTE slightly of radish.

Subcaespitose. On the ground in frondose woods. Ann Arbor. September. Infrequent.

This corresponds to Ricken's notion of *C. brunneus.* But according to specimens of *C. brunneus* collected by myself and others near Stockholm, that species has spores measuring 8-9 x 5-6 micr. and the universal veil is more nearly fuscous than white. It appears as if Ricken had interchanged the two species. In order to compare the two plants I give below the description of the Stockholm *C. brunneus* which is a common plant there. Fries says *C. bruneofulvous* has the stature of *E. cvernius,* which does not apply as far as the stem of the latter is concerned. No violet tints are present in our plant.

433. Cortinarius brunneus Fr.

Syst. Myc., 1821.

"PILEUS 5-8 cm. broad, campanulate or somewhat obtusely conical at first, then *campanulate-expanded and broadly umbonate,* moist, hygrophanous, glabrous on center, *umber-brown when moist,* fulvous-alutaceous when dry, margin decurved and becoming innately fibrillose. FLESH umber when moist, fading, scissile, thin on margin. GILLS adnate, rather broad, distant to subdistant, thick, *dark livid-brown at first,* sometimes with an obscure purplish tinge

then cinnamon-brown, edge entire and concolor. STEM 7-10 cm. long, 5-15 mm. thick, rather stout, firm, *umber or becoming fuscous* and innately streaked with paler fibrils, spongy-stuffed, *clavate-elongated to subequal, at times cingulate above by the* remains of the fuscous universal veil which fades in such a way that the annulus may become paler than the stem. CORTINA whitish, not copious. SPORES elliptical, almost smooth, 8-9 x 5-6 micr., (rarely up to 10 micr. long).

"On the ground among mosses in moist forests of pine and spruce. Stockholm, Sweden. Collected by C. H. Kauffman and confirmed by Romell. September, 1908."

It has somewhat the general appearance of *C. distans* Pk., but is much stouter and its larger gills are less distant, spores slightly longer and universal veil different. It is evident that European authors have confused different species under this name, and hence it seemed advisable to describe the plants from the collecting grounds of Fries. Other collections from Sweden have the same spores as mine. Cooke's figure (Ill., Pl. 868) illustrates the plant well when it is fresh, but his spore-size is wrong. Britzelmayr (Bot. Centralb., Vol. 51, p. 37) reports two species under this name, one of them with the spores in the sense of Cooke. Ricken has also described a different species as shown by the spores (Blätterpilze, p. 174). Quelet's figure (Grevillea, Pl. 113, Fig. 2) does not show the plant well either as to color or veil. Saccardo and Schroeter have given the spore-size approximately correct if we may assume that the Swedish plant is the proper starting point for a revision.

434. Cortinarius distans Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustration: Plate LXXXVIII of this Report.

PILEUS 2-5 cm. broad, *campanulate,* sometimes obtusely conical at first, then campanulate-expanded, *umbonate,* minutely furfuraceous-scaly, *hygrophanous, watery-cinnamon to bay-brown when moist,* tawny or subferruginous when dry, margin usually deflexed, even, often splitting radially. FLESH thin, sordid, brown then dull yellowish. GILLS adnate, then sinuate, *distant, broad,* rigid, thick, *brownish or tawny-yellow at first,* then dark cinnamon. STEM 4-8 cm. long, 5-12 mm. thick, variously thickened to equal, *often attenuated below* and curved, stuffed, fibrillose, watery-brown

and unicolor when moist, the universal veil at first concolor but on breaking up leaving *a whitish, medium, somewhat persistent annular zone.* CORTINA whitish, fibrillose. SPORES oval, *rough-tuberculate,* 6-8 x 5-6 micr. ODOR sometimes slightly of radish. TASTE mild.

Gregarious or caespitose. On grassy ground in frondose woods. Houghton, Ann Arbor, Detroit, etc. July to September. Frequent.

This is one of the earliest summer Cortinarii, appearing preferably in low, grassy woods, about the time that *C. cinnabarinus* appears in the higher lying oak woods; it announces the fact that the Cortinarius season is open. It is somewhat difficult to see much difference in the formal descriptions between this and *C. brunneus* Fr., *C. brunneofulvous* Fr. and *C. glandicolor* Fr., but our plant has quite a distinct habit as compared with those. Its gills are truly distant while *C. brunneus* in spite of Fries' description, has more nearly subdistant gills, according to my use of those terms. *C. glandicolor* Fr. is a more slender-stemmed plant, according to Fries' unpublished plates, well shown also by Cooke (Ill., Pl. 789), although figured as rather stout by Ricken (Blätterpilze, Pl. 50, Fig. 3). Peck, in the original description, seems to have had specimens whose caps were "convex." All the specimens seen by me had a tendency toward the campanulate and umbonate form of pileus. The white zone at or below the middle of the stem is best seen in dry weather. The young stem is sometimes peronate. *C. furfurellus* Pk. is without doubt a synonym.

435. Cortinarius nigrellus Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 2-5 cm. broad, at first conical, soon convex or expanded or subumbonate, minutely silky, hygrophanous, *blackish-chestnut when moist,* paler when dry. GILLS close, *narrow,* emarginate, *brownish-ochre at first,* then cinnamon. STEM 5-7 cm. long, 4-6 mm. thick, subequal, silky-fibrillose, pallid, often flexuous (slightly peronate by a rufous-tinged sheath in the dried type specimens). ANNULUS slight, evanescent." SPORES inequilateral, minute, smooth, 7 x 3.5 micr.

"Mossy ground in woods, New York. October. When moist the pileus has the color of boiled chestnuts, when dry of fresh chestnuts. The incurved margin of the young pileus is whitened by the veil.

The gills are darkest when young. The taste is unpleasant, resembling that of *Armillaria mellea.*"

This is very close to *C. rigida* (sense of Ricken) in stature, colors and spores. *C. rigida* is, however, not uniformly described by European authors, especially as to its spore-size.

436. Cortinarius rigidus Fr. (var.)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 791.
Quelet, in Grevillea, Vol. VII, Pl. 113, Fig. 4.

PILEUS 1-2.5 cm. broad, convex or conico-convex, umbonate or obtuse, *glabrous,* shining, *rufous-brown to chestnut when moist,* ochraceous to buff color when dry, hygrophanous, even and sometimes with white-silky margin, *elsewhere naked.* FLESH thin, rather firm. GILLS adnate then emarginate, rather close, moderately broad, ventricose, *rufous-cinnamon.* STEM 4-5 cm. long, 2-4 mm. thick, equal, flexuous, *fuscescent,* subfibrillose below the whitish, *median annulus,* apex pruinose. SPORES elliptical, smooth, 6-7.5 x 4 micr. ODOR somewhat fragrant, noticeable.

Gregarious or solitary. On the ground in frondose woods. Ann Arbor. September.

It is quite difficult to get any correct idea of this species from European notices. The spore-measurments per Saccardo are "6-11 x 4-6," per Ricken, "6-7 x 3" and according to others, intermediate in size. Our plants are more slender and less dark-colored than *C. nigrellus.* The species has the size of *C. paleaceus* but has a glabrous cap.

437. Cortinarius rigidus (Scop.) Ricken

Blätterpilze, 1912.

PILEUS 2-5 cm. broad, broadly campanulate-expanded, umbonate, firm and glabrous at first, hygrophanous, even, walnut-brown (Ridg.) when moist, *fawn-color on losing moisture,* soon hoary, silky-shining, margin at first incurved and white-silky. FLESH concolor, soon pallid, scissile. GILLS adnate, close, thin, moderately broad, at first pinkish-buff (Ridg.) then clay-color (Ridg.), edge paler. STEM 3-5 cm. long, 4-8 mm. thick, equal, stuffed, soon

hollowed by grubs, brownish within, *white-silky-fibrillose,* sometimes annulate from the white veil. SPORES *minute,* narrowly elliptical, 5-6.5 x 3-3.5 micr., smooth, pale clay-color in mass. ODOR and TASTE mild.

Gregarious or subcaespitose. On mosses under spruce, birch, etc. North Elba, Adirondack Mountains, New York. Collection Kauffman. Infrequent.

The typical Friesian species is said to have a marked odor and specimens from Sweden have larger spores. I have included it (in the sense of Ricken) for comparison. In shape and size it imitates *C. hemitrichus.*

438. Cortinarius hemitrichus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 160, Fig. 2.
Cooke, Ill., Pl. 825.
Gillet, Champignons de France, No. 226.
Ricken, Die Blätterpilze, Pl. 49, Fig. 5.

PILEUS 2-5 cm. broad (rarely larger), campanulate, umbonate, sometimes umbo is obsolete, umbo varying acute or obtuse, *ground color umber, watery-cinnamon or fuscous when moist,* hygrophanous, *more or less canescent from the white, superficial, cirrate fibrils* which at first cover it, sometimes glabrescent in age, color fading to fuscous-gray or ochraceous-tan when dry, margin persistently white-silky. FLESH concolor, thin. GILLS adnate then emarginate, *broad,* close in front, *subdistant behind, at first brownish-gray* to subochraceous, at length dark cinnamon, edge erose-crenulate. STEM 3-6 cm. long, 2-5 mm. thick, equal, hollow, rigid, more or less *annulate at or below the middle* by the white, appressed ring, watery fuscous-brown within, fuscescent or brownish-fuscous without, fibrillose below the annulus. SPORES elliptical, smooth, 6-8 x 4-5 micr. (rarely 9 x 5.5). BASIDIA 30 x 7 micr., 4-spored. ODOR and TASTE mild.

Among mosses or debris in moist places or swampy woods. New Richmond. August-October. Not infrequent.

An extensive study of many specimens showed considerable variation and after some experience it was possible to distinguish two forms with respect to color. Both are conical when very small and become distinctly umbonate. Form (A) had a dark fuscous cap at

first, umber when mature, fading to brownish-gray with a chestnut colored umbo; the gills were fuscous at first, and the annulus less fully developed. Form (B) had a watery cinnamon-brown cap when mature, fading to ochraceous-tan; the gills were pallid, ochraceous at first, and the annulus more persistent. The pileus of both had the characteristic villose covering, the same spores and habit. The gills of our specimens are never truly crowded, and in this respect differ from the European descriptions and from specimens which I collected in Sweden. The microscopic structure of both forms was alike. The upper surface of the fresh pileus is composed of a differentiated layer of two kinds of cells, one forming erect, fasciculate fibres alternating with a layer of larger cells; these fasciculate tufts of narrow cells arise from separate points in the surface of the pileus and produce the villose effect. This upper layer is easily dissolved by rains and often disappears leaving the pileus glabrous. The stem is usually hollow, but it is not rare to find a stuffed or solid axis. Both forms are caespitose. The variation in size is such, even in the same collections, that it is very doubtful whether *C. paleaceus* should be kept separate.

439. Cortinarius paleaceus Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 106, Fig. 4.
Gillet, Champignons de France, No. 241.
Cooke, Ill., Pl. 826.
Plate LXXXIX of this Report.

Differing from *C. hemitrichus* Fr. in more slender habit, longer stem, the universal veil forming delicate, evanescent, subannular, white fibrillose zones along the stem, and in the pileus being more acutely conical. The colors are fuscous, paler.

In moist, mossy places in woods of oak, etc. Ann Arbor. September-October.

The spores, variability and habitat are the same as in the preceding from which it is separated with difficulty.

SUBGENUS HYDROCYBE. No universal veil. Pileus *hygrophanous,* glabrous or innately silky, changing color on losing moisture. Flesh quite thin, scissile. Stem rarely and then slightly subannulate from the remains of the cortina.

Composed of two sections: those with thicker caps whose margin

is at first incurved, and the smaller, slender species with submembranaceous pileus whose margin is at first straight on the stem in the manner of the genus Galera. They are distinguished from the Telamonias only by the absence of the universal veil although several have at times a slight annulus from the collapsing of the copious cortina and not from the outer veil. The pileus is never viscid; it is moist when growing but the moisture disappears quickly in sun and wind so that in our climate the dry, faded plant is more often found than the moist plant. However, for identification of most of the species of this subgenus it is absolutely necessary to know the colors of both the moist and dry pileus since in many of the species the pileii have a similar color when dry. I consider this the most difficult of the subgenera of Cortinarius both because of the great variability of the colors of most species, and because of the unsettled condition in which the European authors have so far left it. While at Stockholm, Sweden, I paid special attention to this group, and found a number of Friesian species; in many cases, however, these do not agree well with the spore characters as given by various authors. It is clear that only a temporary arrangement can be given of our species and it seemed best to put on record descriptions of such species as are close to the Friesian ones, as unnamed variations under the Friesian names. In Michigan the Hydrocybes seem to be much more numerous in the coniferous regions of the State than in frondose woods as appears to be also the case in Europe. I have no doubt we have quite a number of species which are truly American.

Section I. Margin of pileus at first incurved. Pileus thickish, of a medium or fairly large size. Stem somewhat stout.

**Stem or gills at first violaceous.*

440. Cortinarius imbutus Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 870.

PILEUS 2.5-7 cm. broad, *convex* then expanded, obtuse or subumbonate, even, *hygrophanous, chestnut-brown when moist,* changing color, alutaceous or rufous-tinged on disk when dry and then becoming somewhat hoary, margin at first incurved and sometimes

decorated by whitish fibrillose scales from the cortina. FLESH thickish on disk, thin on margin, watery to pallid. GILLS adnate then subemarginate, *broad,* close, not crowded, *violaceous at first* with lavender tinge, soon cinnamon, edge concolor. STEM rather stout, 3-5 cm. long, 5-10 mm. thick, *equal* or nearly so, *solid,* at first violaceous, especially at apex, then silky-whitish and shining, violaceous within at apex, rarely subannulate from the whitish cortina. SPORES narrow, elliptical, smooth, 7-8.5 x 4-4.5 micr. BASIDIA 25-27 x 8 micr., 4-spored. ODOR none.

Gregarious or subcaespitose. On naked ground in low frondose woods. Ann Arbor. October. Infrequent.

This species is based here on the figures of Cooke and those of Fries' unpublished plate at Stockholm. The latter shows a pileus colored like ours and somewhat the same as that of Cooke's figures, but is not "gilvus" as described by Fries in his works. Cooke's figures do not show the violaceous character as do those of Fries. Other authors differ considerably in the application of this name and in the spore-size. The figure of Quelet (in Grevillea, Vol. VIII, Pl. 127, Fig. 2) is referred by Maire (Bull. d. l. Soc. Myc. de France, Vol. 26, p. 28), to *C. bicolor* Cke. and is not at all our plant. The cortina sometimes leaves a row of spot-like shreds on the margin of the pileus, sometimes it forms a slight annulus on the stem, but more often it is entirely evanescent. This species is near *C. castaneus,* from which it differs by its larger, stouter habit, its slightly smaller spores, but especially by the solid stem. Ricken considers it a variety of *C. subferruginea,* but he evidently had a plant with larger spores.

441. Cortinarius saturninus Fr. minor.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 161, Fig. 2.
Gillet, Champignons de France, No. 247.

PILEUS 3-6 cm. broad, campanulate, expanded, sometimes gibbous, glabrous, hygrophanous, pale watery brown when moist, ochraceous-gray-buff when dry, silky around margin. FLESH thin, scissile, violaceous then pallid. Gills adnate then emarginate, adnexed, *close,* moderately broad, *violaceous or tinged purplish at first* then ashy-cinnamon, thin, edge entire. STEM 4-6 cm. long, 6-12 mm. thick, subequal, slightly thicker downwards, terete or com-

pressed, *stuffed, violaceous above,* whitish below, fibrillose, glabrescent and shining when dry. CORTINA whitish. SPORES elliptical, slightly rough, 7-8 x 5-6 micr. ODOR and TASTE mild.

Subcaespitose. On the ground in frondose woods. Ann Arbor. September. Rare.

This is well illustrated by the figures of Fries and of Gillet. Ricken describes a plant with spores measuring 10-12 x 5-6 micr., and with a much darker pileus. The pileus soon fades. It is to be noted that although Fries describes the moist pileus as "dark bay" color, his figures are much paler. I have not seen it dark-colored and that character may belong to another species such as the one described by Ricken.

442. Cortinarius livor Fr.

Epicrisis, 1836-38.

PILEUS 3-4 cm. broad, firm, campanulate, obtuse, sometimes gibbous, *sooty-brown, obscurely olive-gray on center,* scarcely hygrophanous, *not fading,* even, innately subtomentose on disk, margin at first incurved. FLESH thickish on disk, sooty-brown under the center, pallid or whitish elsewhere. GILLS adnate then emarginate, close, relatively *broad, pallid-cinnamon at first.* STEM 4-5 cm. long, sub-equal, sometimes narrower at base, sometimes subbulbous, slightly *violaceous above,* becoming dingy olivaceous to brownish below, *solid,* firm, at first violaceous, within. SPORES broadly elliptical, slightly rough, obtuse, 7-8 x 5 micr. BASIDIA 30 x 7 micr., 4-spored. ODOR slight.

Solitary. On the ground in beech and pine woods. New Richmond. September. Rare.

There is an olive to sooty tinge on cap and base of stem, which along with the violaceous apex of the stem is quite characteristic. The plate of Fries at Stockholm, marked typical, shows a plant with a much shorter stem, otherwise our plant is very like it.

443. Cortinarius castaneus Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 842.

"PILEUS 2-5 cm. broad, firm, campanulate-convex, expanded or gibbous, even, *subumbonate,* scarcely hygrophanous, *dark chestnut*

color, shining when dry, *hardly fading,* margin at first white-silky. FLESH thin, rigid-tough, concolor to pallid. GILLS adnexed, *not broad,* ventricose, *close, violet at first,* then rusty-cinnamon, *edge whitish.* STEM 2-4 cm. long, not truly slender, 4-6 mm. thick, cartilaginous, *stuffed then hollow, violaceous or pallid-rufescent,* silky from the white cortina. SPORES elliptical, rough, 7-9 x 4-5 micr. ODOR and TASTE slight."

Gregarious. On the ground in open woods, etc.

The description is adapted from the works of Fries and his unpublished plate at Stockholm. The characteristic features, by which it is separable from *C. imbutus* and other related species with violet gills, are the *hollow stem* and smaller stature. The figures of Cooke agree with those of Fries, except that they lack the markedly violet stem and gills. Patouillard's figures (Tab. Analyt., No. 128) remind one more of *C. badius* Pk., and Gillet's figure (Champignons de France, No. 202), has aberrant colors. Peck's specimens have the correct spores. The species has been reported by various authors in this country but I have not seen any typical specimens.

***Stem at first white or pallid.*

444. Cortinarius armeniacus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 793.
Ricken, Blätterpilze, Pl. 51, Fig. 4.

PILEUS 5-7 cm. broad, firm, campanulate-subexpanded, broadly *umbonate,* obtuse, glabrous, even, hygrophanous, *sudan-brown when moist* (Ridg.), orange-buff on umbo while drying, orange-buff or tan throughout when dry, margin when dry white silky from the cortina. FLESH thin on margin, scissile, soon pallid. GILLS adnate, emarginate, *broad,* ventricose, close, thin, *at first pallid,* then mars-yellow (Ridg.) to cinnamon, edge entire. STEM 5-7 cm. long, tapering upward, 5-8 mm. thick above, twice as thick below, watery-pallid when moist, dingy whitish when dry, *silky-fibrillose,* rind cartilaginous, stuffed, spongy at base. CORTINA whitish, sparse. SPORES elliptical, slightly rough, 8-9 x 5-5.5 micr. ODOR and TASTE mild or slightly of radish.

Gregarious. Among mosses under spruce and balsam. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914.

Similar in stature to *C. glabrellus,* but differs in the nature of the surface of the pileus both in color and in the structure of the cuticle. As the moisture disappears the umbo fades to pale ochraceous. It agrees well with the figures of Fries at the Stockholm Museum and also with the conception of Ricken. Fries states that the plants are more robust among fallen leaves and the stem is then stout and clavate-bulbous and some of his figures show this.

445. Cortinarius duracinus Fr. var.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 809 (not typical).
Ricken, Die Blätterpilze, Pl. 51, Fig. 2 (not typical).
Quelet, Grevillea, Vol. VII, Pl. 115, Fig. 1 (dry form).

PILEUS 4-10 cm. broad, *convex* then expanded, obtuse, sometimes gibbous, *hygrophanous, watery cinnamon-brown when moist,* tinged rufous on disk, pale ochraceous-tan to buff when dry, *glabrous,* even, margin at first incurved then geniculate and obsoletely silky. FLESH rigid-brittle, *thin,* scissile, concolor, at length pallid. GILLS adnate or slightly subdecurrent, thin, *subdistant,* moderately broad, pallid at first but *soon watery-cinnamon,* edge even or scarcely crenulate. STEM 4-12 cm. long, *tapering downwards or fusiform-subradicate,* 6-15 mm. thick, glabrous, rigid, stuffed then hollow, sometimes compressed, at length shining, *white,* at first cortinate-fibrillose. CORTINA white. SPORES elliptical-almond-shaped, scarcely rough, 7-9.5 x 5-5.5 micr. BASIDIA 32-36 x 8-9 micr. ODOR and TASTE mild.

Gregarious, often in troops or subcaespitose. On the ground, grassy places, etc., in frondose woods of southern Michigan. August to October. Frequent in very wet weather.

One of the larger Hydrocybes, usually found in quantity when it occurs. No good plates seem to exist of the plant as it occurs with us. Our specimens agree in stature, colors, spores, etc., with a collection I found at Stockholm. Ricken gives spores much larger, but Massee's spore-measurements are much smaller. It seems clear that the species of Fries is yet uncertain. A plant agreeing in the spore-character with that of Ricken and otherwise similar to the above species occurs with us in the same habitat. The rigid-brittle, convex pileus, the tapering-subradicating stem and the colors and size distinguish our *C. duracinus.* It has somewhat the appearance

of *C. dolobratus* Fr. as figured by Cooke (Ill., Pl. 811) except in shape of stem and the brown color; furthermore the margin of the pileus of that species is at first incurved. Neither the pileus of our plant nor that occuring at Stockholm had a truly ferruginous or testaceous color when moist.

446. Cortinarius sp.

PILEUS 2-8 cm. broad, *conico-campanulate,* subexpanded, glabrous, even, hygrophanous, rufous-cinnamon when moist, *pale tan when dry* and subshining, margin white-silky at first. FLESH thin, scissile, at length whitish. GILLS adnate-emarginate, *broad,* broadest behind, tapering in front, medium close, ventricose, *pallid-brownish at first* then dark cinnamon, edge erose-crenulate, concolor. STEM 6-10 cm. long, 7-12 mm. thick above, *subbulbous to clavate below, stuffed,* soon cavernous, soft-spongy within, silky-fibrillose, *whitish to pallid.* CORTINA white. SPORES broadly elliptical, 8-9 x 5-6 micr., scarcely rough. ODOR and TASTE mild.

Gregarious to subcaespitose. On the ground in frondose woods, among grass, etc. Ann Arbor. September. Infrequent.

In size this species corresponds to the preceding, but differs in its somewhat cone-shaped, rather acute pileus, broad gills and bulbous to clavate stem. *C. candelaris* Fr. is half-way between the two in having a conic-campanulate pileus and a radicating stem and the spores, according to Ricken, measure 9-11 x 4-5 micr. Found in quantity, but all with clavate-bulbous stems. Specimens of *C. candelaris* from Bresadola had spores measuring 6-7.5 x 5 micr.

447. Cortinarius erugatus Fr.

Epicrisis, 1836-38.

PILEUS 3-6 cm. broad, campanulate-convex, obtuse to broadly subumbonate, *hygrophanous,* pale *umber-cinnamon to grayish-brown with rufous or fulvous umbo when moist,* on drying becoming pale reddish-gray with innate silky fibrils and *silvery sheen,* glabrous, even, margin at first incurved and entirely white-silky. FLESH thin, splitting on margin which is at length recurved. GILLS adnate-emarginate, rather broad behind, tapering in front, *close,* thin, *pallid-brownish at first,* then alutaceous to ferruginous, edge minutely erose-lacerate. STEM 4-7 cm. long (when elongated 8-10 cm.), 5-12 mm. thick, variable in length and thickness, *at first*

clavate-bulbous then elongated, soft-spongy, stuffed, *pallid and streaked with silky white fibrils,* becoming sordid, not cingulate. CORTINA white. SPORES elliptical, rather narrow, smooth, variable in length, 6-8.5 (rarely 9) x 4-4.5 micr. BASIDIA 30 x 6-7 micr., 4-spored. ODOR and TASTE mild.

Gregarious or scattered in thick leaf-mould of hemlock, pine and beech ravines. New Richmond. September-October. Infrequent.

When young the pileus is firm and very silky on edge, when old it becomes soft; the stem is early affected by grubs and soon decays at the base. The color of the pileus changes markedly and hence is very variable. Sections of very young buttons show no universal veil.

448. Cortinarius glabrellus Kauff.

Jour. of Mycology, Vol. 13, p. 35, 1907 (synopsis).

Illustration: Plate XC of this Report.

PILEUS 5-10 cm. broad, hemispherical-convex at first, campanulate-expanded, obtuse or *broadly umbonate,* glabrous, *hygrophanous, with a slight pellicle,* watery cinnamon when moist, *becoming brick-color on drying,* then paler, even, margin at first incurved and white-silky. FLESH concolor then pallid, rather thin. GILLS adnate, moderately broad, broadest behind, close, *distinct,* thin, *at first brownish-pallid* then cinnamon-brown. STEM 4-8 cm. long, 8-18 mm. thick, *varying equal* to subclavate below, rather stout and firm, straight or curved at base, *pallid or whitish,* silky-fibrillose and shining when dry, stuffed. CORTINA white. SPORES elliptical, 6-8.5 x 4-5 micr., smooth. ODOR and TASTE slightly of radish.

Gregarious. On ground in moist, low, frondose woods. Ann Arbor. September-October. Infrequent.

This species was originally referred to the subgenus Phlegmacium. The pellicle of the pileus is, however, scarcely gelatinous although the surface feels somewhat slippery. This and the reddish color which appears on the pileus as it loses moisture are the most striking characters.

449. Cortinarius privignus Fr. var.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 827 (pale, dry, small).
Ricken, Die Blatterpilze, Pl. 52, Fig. 2 (non Fr.).

PILEUS 4-6 cm. broad, gibbous, campanulate-convex, obtuse, hygrophanous, *fuscous-brown when moist, innately variegated-micaceous-silky*, paler and with tinge of drab when dry, glabrous, even, margin at first incurved at length splitting radially. FLESH thin except disk, concolor to pallid. GILLS adnate-emarginate, *rather broad,* ventricose, not crowded, *brownish at first,* then cinnamon, edge concolor. STEM 4-7 cm. long, 7-10 mm. thick, equal or subequal, sometimes *with a bulbous base, pallid with tinge of drab,* silky-shining when dry, glabrous, even, not cingulate, *stuffed then hollow.* SPORES broadly elliptical, obtuse, rough, 8-9 x 5-6 micr. ODOR and TASTE mild.

Solitary or gregarious. On the ground among humus in pine and beech woods. New Richmond. September-October. Infrequent.

The figures of this by Cooke and Ricken do not seem to apply to the same plant. Ours is intermediate between the two and fits more closely to the Friesian sense. The stem is usually clavate or even bulbous at base but equal elsewhere. The color of the pileus is soon similar to that of *C. paleaceus,* but the character of its surface is quite different and the plant is stouter.

450. Cortinarius subrigens sp. nov.

PILEUS 3-5 cm. broad, broadly *convex* from the first, then expanded-plane or subdepressed, *bay-brown* to chestnut and *variegated with white hoariness* when moist, fading quickly to cinnamon-rufous and then *hoary isabelline when dry,* hygrophanous, even, margin at first incurved and cortinate. FLESH rigid-brittle, thin, dingy pallid or brownish. GILLS sinuate-adnate, close, medium broad, *pallid to brownish* then cinnamon, edge entire and concolor. STEM 3-5 cm. long, equal or tapering downward, 5-10 mm. thick, rigid, base often curved, *stuffed then hollow,* at first cortinate-fibrillose, glabrescent and silky-shining, *pallid to white,* rarely subannulate from the white CORTINA. SPORES narrow-elliptical, subinequilateral, slightly rough, 9-10 x 4.5-5.5 micr. BASIDIA 30-32 x 6-7 micr. ODOR and TASTE mild.

Caespitose. On the ground in oak woods. Ann Arbor. October. Infrequent.

Known by its whitish stem, hoary silkiness on the pale chestnut-brown ground-color of the moist cap, the stuffed to hollow stem and its medium size. The stem and cap become firm and rather rigid when dry. When the stem tapers down it approaches *C. rigens* Fr. but the incurved margin of the convex pileus, its hoary-silkiness and more manifest cortina separate it. *C. scandeus* Fr. is distinguished by its smaller spores, conic to umbonate pileus and more slender stem. *C. leucopus* Fr. has a conic to umbonate pileus and different spores.

****Stem and gills becoming brown or fuscescent.*

451. Cortinarius rubricosus Fr. var.

Epicrisis, 1836-38.

PILEUS 3-7 cm. broad, convex-campanulate, broadly umbonate, *fuscous-bay-brown,* subhygrophanous, margin grayish, white-silky, at first incurved, elsewhere glabrous, even. FLESH thickish on disk, watery to pallid. GILLS adnexed-emarginate, *rather narrow,* close to subdistant, *soon umber-brown,* pallid-brownish at first, edge white-fimbriate. STEM 3-5 cm. long, 8-12 mm. thick above, rather stout, *clavate-bulbous,* 12-18 mm. thick toward base, firm, *solid,* grayish-pallid, *soon fuscescent,* at length dark fuscous umber below and within, at first densely white-fibrillose from cortina. SPORES broadly elliptical, rough-tuberculate, 8-10 x 6-7 micr. BASIDIA 40-45 x 9 micr., often with dark brownish content; *sterile cells* on edge of gills, slender, subclavate above.

Solitary or gregarious. On the ground among humus in hemlock woods. New Richmond. September. Infrequent.

This differs somewhat from the Friesian plants in its lack of reddish tints on the cap, and from the plant of Ricken in its larger spores. Britzelmayr gives the spores the same size as ours, and my collection from Sweden also has such spores but shows the slight rufous color when dry. It needs further study but surely belongs in its present position in the group.

452. Cortinarius uraceus Fr.

Epicrisis, 1826-38.

Illustration: Fries, Icones, Pl. 162, Fig. 3.

PILEUS 2-5 cm. broad, firm, at first ovate or campanulate then convex-subexpanded, often with a mammillate umbo, hygrophanous, *smoky chestnut brown* (Ridg.) *when moist,* even, fading to cinnamon-brown or isabelline, with blackish streaks, often *blackish on umbo,* margin persistently decurved. FLESH thin except disk, scissile, watery chestnut (moist), fragile when dry. GILLS broadly adnate, *broad,* close to subdistant, *dark watery brown at first,* then auburn to dark rusty-brown (Ridg.), edge at length black. STEM 4-9 cm. long, 4-10 mm. thick, equal or tapering slightly upward, becoming flexuous, *firm, stuffed then hollow,* pallid when fresh, soon brownish-streaked, *fuscescent, in age blackish,* rarely with narrow white evanescent annulus. CORTINA whitish, forming a silky zone on the young margin of pileus, fuscescent. SPORES broadly elliptical, 7-8 x 5-6 micr., rough. ODOR of radish when plants are crushed. TASTE mild.

Gregarious-subcaespitose. Among moss under balsam, spruce, etc. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Frequent after heavy rains.

The species is interpreted here in the sense of the Icones of Fries. It is well marked by its spores, dark colors and broad gills. In dry weather it is scarcely recognizable; it is then often pale tan and streaked with blackish stains, quite fragile and split on the margin of the cap. There is no universal veil in the young stage, the lack of which separates it from *C. glandicolor* which is nearest to it in color and habit. As characterized by Fries, an olivaceous color is sometimes present. This form appears to be that of Ricken with very large spores. In the Monographia, Fries himself raises the question whether it is not a composite species. Cooke (Ill., Pl. 796) figures a slender plant and it is possible that this is also a separate form, as I collected such a plant in Sweden with spores 8-10 x 5-6 micr.

453. Cortinarius juberinus Fr. var.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 797.

PILEUS 2-4 cm. broad, campanulate-convex, then expanded, umbonate or umbo obsolete, *chestnut-brown to watery cinnamon* when moist, ochraceous when dry, subhygrophanous, glabrous, even, *silky-shining when dry,* margin at first incurved and white-silky from the cortina. FLESH concolor, thin. GILLS adnate then subemarginate, *subdistant,* rather broad, thin, at length ventricose, pallid-brown then cinnamon, interspaces somewhat venose, edge concolor. STEM 3-7 cm. long, 3-5 mm. thick, moderately slender, equal or subequal, even, *stuffed then hollow,* pallid at first, then brownish or fuscescent, innately silky-fibrillose. CORTINA white, fugacious. SPORES 6.5-7.5 x 4.5-5 micr., broadly elliptic-oval, scarcely rough. BASIDIA 27-30 x 6-7 micr. ODOR and TASTE slight or none.

Solitary or scattered. On the ground near wet or springy places in woods or swamps. Ann Arbor, New Richmond. September. Infrequent.

Distinguished by the spores, subdistant gills, hollow stem and colors. The pileus does not become black-stained nor black-streaked in age as do some similar species of this subgenus. The color of the pileus is variable, sometimes approaching tawny-cinnamon, and its surface is silky-shining as in *C. cinnamomeus.* Our plant agrees better with the unpublished figures of Fries and those of Cooke, than with the description of Fries; in his description, Fries states that the pileus is very bright cinnamon-fulvous, but this is not shown in his figure. The habitat is also different. The spores agree with the size given by Cooke, and doubtless we have his species here.

454. Cortinarius præpallens Pk.

N. Y. State Bull. 2, 1887.

"PILEUS 1-4 cm. broad, subconical, then convex or expanded, glabrous, *hygrophanous, brown or chestnut color when moist,* pallid-ochraceous when dry. FLESH yellowish-white, thin. GILLS rounded behind or subemarginate, *crowded,* lanceolate, *reddish-umber* then fuscous-cinnamon. STEM 2-7 cm. long, 4-8 mm. thick,

equal, subflexuous, fleshy fibrous, subsilky, *pallid or brownish.* SPORES subellipsoid, 7-10 x 6.5 micr.

"On bare ground in woods, New York."

Section II. Margin at first straight on the stem, Galera-like. Slender-stemmed, with the pileus mostly conical-campanulate and almost membranous.

**Stem or gills at first violaceous.*

455. Cortinarius fuscoviolaceus Pk.

N. Y. State Mus. Rep. 27, 1875.

"PILEUS 1-2 cm. broad, convex (?) umbonate, soon expanded and centrally depressed, *glabrous, hygrophanous, chestnut-brown tinged with violet,* the margin whitened by silky fibrils. GILLS rounded behind, at first plane then ventricose, rather distant, *dark violaceous at first* becoming subcinnamon. STEM 2.5-4 cm. long, *slender,* flexuous, equal, solid, silky-fibrillose, colored like pileus." SPORES broadly elliptical, minute, smooth, 6-7 x 3-4 micr.

"Sphagnous marshes, New York."

A very similar plant occurs at Ithaca, New York., with spores 7-10 x 3-4 micr. The type-specimens, however, show the spores as given above.

456. Cortinarius erythrinus Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 798, A.
Ricken, Blätterpilze, Pl. 53, Fig. 2.
Quelet, Grevillea, Pl. 115, Fig. 2.

PILEUS 1-2 cm. broad, rather firm, *conic-campanulate,* then subexpanded and subacutely umbonate, chestnut brown, *umbo umber or blackish,* paler toward margin, hygrophanous, glabrous, even, soon fading. FLESH thin on margin, scissile, watery-brown when moist. GILLS rounded behind and adnexed, *rather broad,* ventricose, close to subdistant, pallid or pale brownish then cinnamon, edge entire. STEM slender, 4-6 cm. long, 3-4 mm. thick, fragile, *equal,* flexuous, stuffed then hollow, *apex violet at first,* pale brownish elsewhere, sometimes violet-tinged throughout, sparsely cor-

tinate, glabrescent, shining when dry. SPORES short, elliptical, 7-9 x 5-6 micr., almost smooth, pale ochraceous. ODOR and TASTE mild.

Gregarious. On bare soil in mixed woods. North Elba, Adirondack Mountains, New York. Collection Kauffman. September, 1914. Infrequent.

The slender form of the species is illustrated by Cooke. It agrees in all respects with plants found in Sweden. The stouter forms approach *C. castaneus.*

***Stem white, pallid or dingy brownish.*

457. Cortinarius decipiens Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 798, B.
Ricken, Blätterpilze, Pl. 53, Fig. 8.

PILEUS 2-4 cm. broad, at first *conico-campanulate,* then subexpanded with decurved margin, *prominently umbonate,* vinaceous-cinnamon (Ridg.), *umbo blackish while losing moisture,* hygrophanous, *glabrous,* silky-shining, margin with white-silky fibrils. FLESH thin, concolor. GILLS adnate, then emarginate-uncinate, close, *rather broad,* at first pallid or cinnamon-buff, *at length mars-yellow* (Ridg.), edge white-crenulate at first. STEM slender, 7-10 cm. long, 4-7 mm. thick, scarcely incrassate downward, stuffed then hollow, becoming flexuous, fragile, *pallid to silky-shining,* glabrous, brownish within. SPORES narrowly elliptical, 7-9 x 4-4.5 micr., scarcely rough. ODOR and TASTE slightly of radish.

Gregarious or subcaespitose. North Elba, Adirondack Mountains, New York. On mosses, sphagnum, etc., in balsam and tamarack swamp. Infrequent.

This species is placed here in the sense of Ricken. I doubt whether it is the typical Swedish species which I collected near Stockholm; the stem of that was rubello-tinged, the gills were truly cinnamon and the spores measured 9-10 x 6 micr. Britzelmayr also gives the latter size. When young and moist the cap of our plants is chestnut-brown.

Var. *minor.* PILEUS 1-2 cm. broad, stem 2-3 cm. long, 2-3 mm. thick. GILLS tawny at first then mars-orange (Ridg.), thickish, edge entire. STEM short, sub-bulbillate at base, often tinged sub-

orange or reddish-orange by deposit of the spores. SPORES 7-9 x 5-5.5 micr. Under conifers, New York.

Both forms are known by the gills becoming mars-orange at maturity. Sometimes the silky fibrils on the margin of the cap are slightly rufous. No universal veil is present. The cortina is whitish.

458. Cortinarius leucopus Fr. (var.)

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 843.

PILEUS 1-3 cm. broad, conico-campanulate, at length expanded and umbonate, even, *glabrous,* roods-brown (Ridg.) when moist, *cinnamon-buff* (Ridg.) *when dry,* hygrophanous. GILLS adnate-sinuate, ventricose, not broad, subdistant, *pallid at first,* then ochraceous-tawny (Ridg.), edge entire. STEM 3-4 cm. long, 2-4 mm. thick, rather slender, *equal, silky-fibrillose or sometimes subcingulate* from the white cortina, stuffed to hollow, *white or pallid.* SPORES narrow, elliptic-oblong, scarcely rough, 7-8 x 3.5-4.5 micr. (rarely 9 micr.). ODOR none.

Gregarious or subcaespitose. On the ground or moss in pine and spruce woods. North Elba, New York, and New Richmond, Michigan. September-October. Infrequent.

This approaches *C. juberinus* Fr., but pileus is more acute, spores of a different shape and stem scarcely brownish. The spores agree with those given by Ricken and Britzelmayr, but the colors, habit and the occasionally cingulate stem are shown in Fries' unpublished plate. No form has been seen with a pure white stem as described by Fries. Cooke's figures show the faded condition. The moist young pileus is margined by the white silky remains of the cortina.

459. Cortinarius scandens Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 830 (dry condition).
Cooke, Ill., Pl. 845 (as *C. obtusus*).
Gillet, Champignons de France, No. 236 (as *C. obtusus*).
Fries, Icones, Pl. 163, Fig. 3 (as *C. obtusus*).

PILEUS 1-3 cm. broad, *rigid,* conico-campanulate, *then expanded-*

umbonate, glabrous, *watery rusty-fulvous at first when moist* and striatulate on margin, *soon* honey-colored or alutaceous to paler when dry, soon even, hygrophanous. FLESH thin, concolor. GILLS adnate, sometimes emarginate, *narrow,* close to subdistant, thin, *pallid-brown then cinnamon,* edge concolor. STEM 3-8 cm. long, 2-5 mm. thick, *tapering downward,* thickened above, *attenuated at the slender curved base,* flexuous, *soon rigid,* stuffed then hollow, fulvous (moist) pallid or white and shining when dry, scarcely fibrillose at the first by remains of the scanty white CORTINA. SPORES short-elliptical, *almost smooth,* 6-7.5 (rarely 8) x 4-5 micr. BASIDIA 25-30 x 6-7 micr. ODOR none or slight.

Solitary, scattered or subcaespitose in pairs. Among leaves and humus in frondose and conifer woods. Ann Arbor, New Richmond. September-October. Frequent in the late autumn.

It is very variable in color, and the gills are sometimes rather broad, while the spores are consistently small. The plants are often the shape and color of *C. obtusus* Fr. as illustrated by various authors, so that it seemed advisable to refer to these figures. It seems that *C. obtusus* Fr., of which I obtained several collections at Stockholm, differs mostly in its larger size, its quite broad gills and larger spores; these measure 9-10 x 5.5-6.5 micr. It is to be noted that the figures of Fries (Icones, Pl. 163, Fig. 1) of *C. scandens* can scarcely be the form referred to in his descriptions. In "Monographia" he says distinctly that the stem is "incrassate at apex, always attenuate at the base," while in the figures the stem is not attenuate. The colors of his figures also do not correspond with the descriptions. I have followed the idea of the description, as did Cooke, Ricken, Britzelmayr and others. We doubtless have forms of *C. obtusus* also, but they need further study. Fries' unpublished plate of *C. rigens* Fr. shows that species to differ from *C. scandens* in its larger, stouter habit and convex or gibbous pileus; its gills are not broad.

460. Cortinarius lignarius Pk.

N. Y. State Mus. Rep. 26, 1874.

Illustration: Plate XCI of this Report.

PILEUS .5-3 cm. broad, *conico-campanulate, subacutely umbonate,* hygrophanous, glabrous, *watery-cinnamon to chestnut-fulvous when moist,* not striate, fading to pale fulvous-tan, innately silky-

shining, margin at first straight and soon naked. FLESH submembranaceous, concolor. GILLS adnate-seceding, *broad,* close, thin, *ochraceous-pallid at first* then somewhat rusty-brown. STEM 2-5 cm. long, rather slender, 2-3 mm. thick, equal, pallid or subrufous toward base, often curved at base, silky-fibrillose below, *subcingulate at or above the middle by silky-white remnants of the rather copious cortina,* at length tubular, base white-mycelioid. SPORES narrow-elliptical, smooth, 6.5-7 x 4-5 micr. BASIDIA 25 x 6 micr., 4-spored. ODOR none. TASTE slight.

Subcaespitose or solitary on very rotten wood, in coniferous or mixed woods. New Richmond. September. Infrequent.

Known by the very marked subacute umbo, reddish-fulvous pileus, the cingulate stem, spores and habitat. Peck placed it under the Telamonias, but although slight colored floccules are sometimes present on the edge of the annulus, there is no other indication of a universal veil. When fresh there is sometimes a fleeting tint of violaceous at the apex of the stem. Sometimes it grows on logs when these are far advanced in decay.

461. Cortinarius acutoides Pk.

N. Y. State Mus. Bull. 139, 1909.

Illustrations: Ibid, Plate X, Fig. 4-8.

"PILEUS 8-16 mm. broad, *conic or subcampanulate,* acutely umbonate, hygrophanous, not striate, *pale chestnut color at first,* floccose and margined by the fibrils of the cortina, *whitish and silky-fibrillose when dry.* GILLS adnexed, subdistant, ascending, *narrow,* yellowish-cinnamon. STEM 2.5-5 cm. long, 2-3 mm. thick, solid or with a small hollow tubule, *white,* then whitish. SPORES 8-10 x 6-7 micr., ellipsoid.

"Swamps. Massachusetts. October. Closely allied to *C. acutus,* from which it differs in the darker color of the young moist pileus and whiter color of the mature dry pileus, the white color of the young stem, the adnexed gills, and especially by the larger spores and absence of striae from the pileus."

***Stem yellowish or ochraceous.*

462. Cortinarius acutus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 845.
Quelet, in Grevillea, Vol. VII, Pl. 112, Fig. 5.
Engler and Prantl, Pflanzenfamilien, Part I, Sect. 1,** Fig. 118 A.

PILEUS 5-25 mm. broad, *conical* or conic-campanulate with acute umbo, *striate to the umbo* and watery rufous-cinnamon when moist, pale alutaceous when dry, hygrophanous, minutely silky, margin white-cortinate, glabrescent. FLESH submembranaceous, yellowish. GILLS adnate seceding, close or scarcely subdistant, thin, not broad, *pale ochraceous at first* then ochraceous-cinnamon, edge entire. STEM 4-8 cm. long, *slender,* 1-2 mm. thick, equal, flexuous, tubular, *yellowish at first* becoming paler, silky from the evanescent white cortina, glabrescent. SPORES elliptical, smooth, 7-9.5 x 5-5.5 micr.

In moist places, swamps, etc. September-October. Specimens from Massachusetts by G. E. Morris.

Distinguishable from the preceding two by the clearly striate pileus and yellowish stem when fresh and moist. It is easily mistaken for a Galera.

Inocybe Fr.

(From the Greek *is,* a fibre, and *kybe,* a head, referring to the silky-fibrillose covering of the pileus.)

Ochre-brown-spored. Pileus conical or campanulate at first, *innately silky, fibrillose or fibrillose-scaly;* the cuticle continuous to the stem in the form of a more or less evanescent, fibrillose cortina. Volva none. Gills and spores pale and sordid; *edge of gills provided with cystidia or saccate, sterile cells.*

Putrescent, mostly terrestrial, often with a characteristic odor. *Mostly small or medium-sized plants;* intermediate between Hebeloma and Cortinarius, lacking mostly the viscid pileus of the former, and the delicate, cobwebby cortina and the darker brown or rusty spores of the latter; formerly joined with the genus Hebeloma. They are usually omitted from the list of edible species on account of their mostly disagreeable odor and taste. Some

are known to be markedly poisonous, e. g., *I. infida* Pk., *I. infelix* Pk., *I. fibrosa* Bres., etc.

The PILEUS has a cuticle composed of radiating, *parallel* fibrils, which breaks up more or less during development and in age, so as to form minute radiating cracks (rimose), or still more so, to form fibrillose scales, which in some species become recurved (squarrose-scaly); in others, the surface fibrils remain more or less interwoven and do not become rimose; in a few species the cuticle is at first viscid. These different modes of adjustment of the fibrils form a basis for a division of the species into sections. The color of the cap is rarely bright, it is mostly of whitish, ochraceous, grayish or brownish shades; *I. frumentacea* and its variety *jurana,* have sometimes a beautiful vinaceous or purple color, and are well-marked by it. Others, like *I. pyriodora,* have a characteristic pinkish tint to the flesh as they grow older. In most cases, however, color-descriptions are apt to be confusing, as the shades of brown, fawn, gray, or ochraceous vary in the same species and the same plants. For a satisfactory study of this group, the interested student should attempt to make colored sketches of the species he finds, accompanied by spore and cystidia drawings. It is practically impossible to be sure of a species of this genus without the use of the microscope. The GILLS may be adnexed or almost free, occasionally entirely free; adnate to subdecurrent in a few species. The color of the mature gills is usually of a dull, sordid or pale fuscous, hard to describe, but characteristic for many of the species, so that one soon learns to distinguish an Inocybe by the tints of the gills. The color of the gills is very similar to that of the genus Hebeloma. However, it may vary in some species to brown, yellow or olivaceous shades, and in one species becomes dingy purplish. A few have been described with pale violet or blue gills when young, but usually the young gills are whitish. The STEM is fibrous, usually rather rigid at maturity, its surface varying from slightly silky to fibrillose or squarrose-scaly. In the last case the stem is somewhat peronate or sheathed by the remains of the fibrillose-scaly covering which was continuous in the young plant from cap to stem; such species belong to the "Squarrosae" section. The apex of the stem is usually mealy or scurfy. It may be stuffed and later hollow, but most species have a solid stem. Some species are well marked by the striking color of the lower part of the stem. The stem of *I. calamistrata* Fr. has a dark greenish-blue base. The base of the stem of *I. hirsuta* Lasch., is said to be bright green; this species has not been found with us. In *I. cincinnata* Fr., the apex of the

stem as well as the young gills are said to be dark violet. The FLESH is characterized in some species by changing to a reddish color in age, e. g., *I. pyriodora* Bres., *I. repanda* Bres., *I. trinii* Bres., *I. incarnata* Bres. and *I. bongardii* Weinn. Some of these have not been found here. The SPORES are of great importance in the diagnosis of species. They may be spiny, angular or smooth. For the convenience of the student, each *section* may therefore be divided into the rough-spored and the smooth-spored species. Some authors have gone so far as to suggest the use of this character to establish genera. In some species, however, the spores are scarcely angular, i. e., they are intermediate between the smooth and angular shapes; an example of this condition is *I. decipiens.* In two of our species, *I. calospora* and *I. asterospora,* the spores are spiny, i. e., the surface of the spores is covered with slender, rod-like tubercles producing a pretty effect when seen under the microscope. Even the smooth spores often vary sufficiently in size and shape so as to provide means for the identification of species. CYSTIDIA are present in many species on the sides and edge of the gills; they are usually ventricose-lanceolate, mostly obtuse and covered at the apex by crystal-like deposits. In other species the cystidia are lacking, and only the edge of the gills is provided with differentiated structures; these are inflated-rounded at the apex in the form of obclavate or saccate, *sterile cells,* somewhat longer than the basidia. Ricken has used the rough and smooth characters of the spores, and the presence or absence of cystidia in such a way as to group the species under three divisions: (a) those with rough spores; (b) those with smooth spores and cystidia and; (c) those with smooth spores and without true cystidia. I have preferred to retain the more natural Friesian arrangement, modified so as to use the spore character under the sections.

The species included below have been interpreted from the point of view of the eminent mycologist, Ab. Bresadola, who has revised the older conceptions, and cleared up the complicated mass of synonyms for the European forms. The recent work of Ricken, which is also based on Bresadola's opinions, has helped not a little to arrive at definite conclusions.

Key to the Species

(A) Spores angular, tubercular or spiny.
(a) Pileus viscid, small, tawny-ochraceous. 493. *I. trechispora* Berk.
(aa) Pileus not viscid.
(b) Pileus squarrose-scaly, fuscous to cinnamon.
(c) Spores spherical, with rod-like spines. 468. *I. calospora* Quel.
(cc) Spores subrectangular or wedge-shape in outline, irregular. 467. *I. leptophylla* Atk.
(bb) Pileus not squarrose-scaly.
(c) Pileus appressed fibrillose-scaly.
(d) Stem fulvous-tinged; pileus 3-6 cm. broad, umbo fulvous. 487. *I. repanda* Bres.
(dd) Stem whitish; pileus brownish-ochraceous, large; spores elongated-oblong in outline. 474. *I. decipientoides* Pk.
(cc) Pileus soon rimosely cracked, fibrillose or silky.
(d) Disk of pileus white and glabrous, pale grayish-lilac or grayish-drab on the margin. 485. *I. albodisca* Pk.
(dd) Disk not sharply marked in color.
(e) Pileus creamy-white or tinged ochraceous, large, 4-8 cm. 484. *I. fibrosa* Bres.
(ee) Pileus not whitish.
(f) Spores subglobose, with blunt spines; pileus brown or rufous-brown. 486. *I. asterospora* Quel.
(ff) Spores irregularly-angular; pileus dark fuscous-brown. 483. *I. radiata* Pk.
(AA) Spores smooth, (i. e., not angular, etc.).
(a) Cystidia present on sides of gills.
(b) Stem squarrose-scaly or floccose-scaly; pileus brown, squarrose-scaly.
(c) Spores 10-13 micr. long; stem squarrose-scaly. 463. *I. hystrix* Fr.
(bb) Pileus not squarrose-scaly.
(c) Pileus fibrillose-scaly, rarely or not at all rimose.
(d) Spores elongated-subcylindrical, 11-18 x 4-6 micr.; pileus brown, umber, etc. 471. *I. lacera* Fr. 472. *I. infelix* Pk.
(dd) Spores not markedly elongated.
(e) Small plants; pileus 1-2.5 cm. broad, tawny-brown; stem tinged rufous-brown. 473. *I. flocculosa* Berk.
(ee) Larger; pileus 2-6 cm. broad.
(f) Flesh tinged reddish or pinkish in age; pileus whitish then sordid brownish-ochraceous; taste sweetish. 469. *I. pyriodora* Bres.
(ff) Flesh not changing to reddish.
(g) Pileus and mature gills smoky-brown; spores 7-8 x 5 micr. 470. *I. scaber* Fr.
(gg) Pileus dark brown or rufous-brown, umbo darker; stem faintly rufous-tinged; spores 8-10 x 5-5.5 micr. 477. *I. destricta* Fr.
(cc) Pileus at length rimose, fibrillose or subscaly. [See also (ccc).]
(d) Spores obscurely angular, or almost even; pileus large, whitish, 4-8 cm. broad. 484. *I. fibrosa* Bres.
(dd) Spores smooth; pileus not whitish.
(e) Pileus dark brown or rufous-brown with chestnut-brown umbo; stem rufous-tinged. 477. *I. destricta* Fr.
(ee) Pileus paler; stem not rufous-tinged.
(f) Gills, when young, pale violaceous; pileus grayish-buff; spores 8-10 x 5-6 micr. *I. violaceifolia* Pk.
(ff) Gills not violaceous; pileus fawn-color, almost chestnut-brown when young and cortinate, often appressed-scaly. 482. *I. eutheloides* Pk.

(ccc) Pileus neither scaly, nor rimose, but persistently silky or fibrillose.
(d) Pileus violaceous-lilac. 491. *I. lilacina* Pat.
(dd) Pileus some other color.
(e) Pileus small, 1-2.5 cm. broad.
(f) Pileus and stem white, glossy-shining. 490. *I. geophylla* Fr.
(ff) Pileus and slender stem rufous; in wet places. 492. *I. scabella* Fr. var. *rufa.*
(ee) Pileus larger, 2-6 cm. broad.
(f) Pileus whitish to straw-color or tinged ochraceous, woolly-fibrillose; stem white. 488. *I. sindonia* Fr.
(ff) Pileus ochraceous or ochraceous-yellow, fibrillose-subscaly; stem pale ochraceous in age. 489. *I. subochracea* Pk.

(aa) Cystidia lacking on sides of gills; edge of gills provided with sac-shaped sterile cells.
(b) Pileus when fresh squarrose-scaly or floccose-warty; stem sheathed by floccose or fibrillose scales.
(c) Gills purplish-red; pileus smoky-brown, stem blood-red within; mostly in gardens and greenhouses. (See 236. *Psalliota echinata.*)
(cc) Gills not red.
(d) Stem dark greenish-blue towards base; pileus coffee-brown to wood-brown. 465. *I. calamistrata* Fr.
(dd) Stem and pileus fulvous-yellowish or ochraceous; stem at length tubular. 466. *I. caesariata* Fr.
(bb) Pileus not squarrose-scaly.
(c) Pileus appressed-scaly.
(d) Pileus large, 3-8 cm., smoky-purple, tinged wine-color, broadly umbonate. 475. *I. frumentacea* (Fr.) Bres.
(dd) Pileus olivaceous-fulvous; gills at first olive or fawn-yellow; flesh citron-yellowish; cortinate; spores 10-11 x 5.5-6.5 micr. *I. dulcamera* Schw.
(cc) Pileus at length rimose, fibrillose or subglabrous.
(d) Pileus smoky-purple, vinaceous, conico-campanulate. 475. *I. frumentacea* Bres. var. *jurana* Pat.
(dd) Pileus not purplish.
(e) Pileus whitish, tawny, ochraceous or yellowish.
(f) Center of pileus covered with white hoary-silky fibrils, convex and obtuse. 481. *I. lanatodisca* sp. nov.
(ff) Not hoary-silky.
(g) Spores 9-12 x 5-6 micr.; pileus conic-campanulate, pheasant-yellow to ochraceous-tan, virgate. 478. *I. fastigiata* Bres.
(gg) Spores smaller.
(h) Pileus pale yellow to straw color, lutescent; stem lutescent. 480. *I. cookei* Bres.
(hh) Pileus ochraceous to tawny-yellowish, gibbous; stem irregularly clavate. 479. *I. curreyi* Berk.
(ee) Pileus some shade of brown.
(f) Pileus glabrous, sublubricous on umbo, sordid livid-brown, putrescent. 494. *I. glaber* sp. nov.
(ff) Pileus fibrillose-virgate and very rimose, brown; spores 7-9 x 5-6 micr. 476. *I. rimosa* Fr. (Sense of Ricken.)

Section I. Squarrosae. Pileus at first densely scaly or squarrose-scaly; stem concolor.

**Spores smooth.*

463. Inocybe hystrix Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 106.
Cooke, Ill., Pl. 424.

PILEUS 2-5 cm. broad, convex-expanded, broadly umbonate, *clothed* with *dense wood-brown, pointed or squarrose scales,* not rimose, nor striate; flesh white. GILLS adnate, not broad, close, pallid-alutaceous then brown, edge white-floccose. STEM 4-8 cm. long, 3-6 mm. thick, equal or enlarged below, *peronate to above the middle by squarrose scales,* concolor. SPORES elliptic-ovate, inequilateral, 9-13 x 5-5.5 micr., *smooth,* brown. CYSTIDIA on sides and edge of gills, ventricose below, obtuse, 70-90 x 12-17 micr. ODOR none.

Scattered or solitary. On the ground in mixed woods of northern Michigan. Marquette, Ishpeming. August. Rare.

Known by the dense recurved scales on the stem and by the large spores.

465. Inocybe calamistrata Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 106.
Gillet, Champignons de France, No. 360.

PILEUS 1-4 cm. broad, campanulate-convex, obtuse, surface soon broken up into dense, coffee-brown, squarrose scales, not rimose; flesh thin, *tinged dilute reddish,* darker in age. GILLS adnate-seceding or becoming sinuate, *broad,* close, soon cinnamon, at length ferruginous-sprinkled, edge thickish, white-flocculose. STEM firm, 4-8 cm. long, 2-5 mm. thick, tapering upward, *smoky-greenish-blue below,* fuscous or tinged rufous-brown above, *clothed with recurved fibrillose scales,* at length merely fibrillose, solid. SPORES elliptic-oblong, subreniform, obtuse at ends, 10-12 x 5-6 micr., *smooth,* ferruginous-brown in mass. CYSTIDIA none. STERILE CELLS on

edge of gills obclavate, rounded-inflated above, about 30 x 12 micr. ODOR slight.

Scattered or subcaespitose. On the ground in low woods, throughout the State. Marquette, Houghton, Bay View, New Richmond, Detroit, Ann Arbor. July-September. Infrequent and never plentiful.

Known by the smoky-blue lower part of the stem. The flesh turns pinkish-red in young fresh specimens where cut. When old or dry the stem is almost black below.

466. Inocybe cæsariata Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 109.
Ricken, Die Blätterpilze, Pl. 31, Fig. 4, 1911.

PILEUS 2-5 cm. broad, broadly convex and obtuse, *at first covered by dense, leather-yellow, ochre-yellowish or fulvous, tomentose-fibrillose or erect warts or scales,* becoming loosely fibrillose scaly, appressed fibrillose on margin, not rimose, margin incurved and at first connected with stem by a dingy-white or ochraceous fibrillose cortina. FLESH white or whitish, at length sub-ochraceous, *thick and compact on disk,* thin on margin. GILLS rounded-ascending behind, adnate-seceding or at length subdecurrent by tooth, rather broad, *ventricose,* dull ochraceous-yellowish then ferruginous-ochraceous or cinnamon, edge white-flocculose. STEM 1.5-4 cm long, 2-6 mm. thick, *usually rather stout and short,* equal, at first floccose-scaly below, usually densely floccose-fibrillose, *concolor,* apex flocculose-scurfy, *soon definitely tubular,* ochraceous-whitish within. SPORES short oblong, rounded-obtuse at both ends, subreniform, 8-10 x 5-6 micr., ochraceous-cinnamon in mass, *smooth.* CYSTIDIA none; *sterile cells* on edge of gills variable, from inflated-pyriform to flexuous-cylindrical. ODOR none. TASTE mild.

Gregarious, usually many individuals in favorable spots, as if sown. On the ground in moist places, naked soil or among short grass, near springs, lakes or water courses. Spring and autumn. Ann Arbor, New Richmond. Not infrequent locally.

A rather variable plant when found under different weather conditions. In the luxuriant state or when fresh the cuticle of the pileus is broken up into dense floccose warts the bases of which

radiate and connect with one another by silky white fibres; after being exposed for some time to rain or wind, the scales become more appressed-fibrillose, straw color or paler. The color is well shown in Fries' figures, but the scales on the cap and stem are more highly developed at times, so that it should be referred to this section, to which Ricken also referred it. It is easily mistaken for a Cortinarius. *I. unicolor* Pk., *I. subtomentosa* Pk., *I. subdecurrens* E. & E. and *I. squamosodisca* Pk. are related to it.

***Spores tubercular-spiny.*

467. *Inocybe leptophylla Atk.

Amer. Jour. of Bot., Vol. V, p. 212, 1918.

PILEUS 1-4 cm. broad, convex-expanded, obtuse, *covered with dense, cinnamon or umber, squarrose or pointed scales,* fibrillose on margin; flesh thin, whitish. GILLS rounded behind, adnexed, broad, *ventricose,* pallid becoming ferruginous-cinnamon, *edge white-crenulate.* STEM 2-4 cm. long, 2-4 mm. thick, equal, solid, *floccose-fibrillose* to tomentose-scaly, concolor, paler within, apex pruinose. SPORES subrectangular in outline, almost twice as long as wide, varying in shape, *with scattered obtuse tubercles* which are wider at base, 7-11 x 5-7 micr., ferruginous-brown. CYSTIDIA lacking; sterile cells on edge of gills, short, rounded-obclavate.

Solitary or gregarious. On the ground, in coniferous woods, or in swamps. Bay View, New Richmond, Ann Arbor. June-September. Rare.

This is apparently one of the American forms of *I. lanuginosa* (Fr.) Bres., to which Peck referred his species in his monograph of the New York Inocybes. (N. Y. State Mus. Bull. 139, p. 51.) But this seems unwarranted in view of the spore-measurements of *I. lanuginosa* given by such authorities as Bresadola and Schroeter who agree that the spores of the European species are much larger, about 11-15 x 8-9 micr. Specimens from three widely different localities in Michigan and New York yielded the same, smaller-sized spores. Schroeter has described a similar species, *I. lanuginella,* of which the spores are given the same size as ours, but have "prominent angles;" this may be our plant.

* This species was reported as *I. entomospora,* (see Mich. Acad. Sci. Rep. 8, p. 26) but became a *nomen nuda* by the publication of the above name by Atkinson after this report was in press.

468. Inocybe calospora Quel.

Bresadola, Fungi Trid., 1881.

Illustrations: Ibid, Pl. 21.
Plate XCI of this Report.

PILEUS 1-3 cm. broad, conic-campanulate at first, then expanded, umbonate, fuscous-rufescent, fading to ochraceous, umbo darker, covered, except umbo, by loose or recurved fibrillose scales, margin fibrillose and paler; flesh thin, pale. GILLS adnexed to almost free, rather narrow, subventricose, pallid then pale fuscous-cinnamon, edge white-fimbriate. STEM 3-6 cm. long, 1.5-2.5 mm. thick, firm, rigid-elastic, subequal, stuffed then hollow, pale brown, rufescent, sprinkled with a delicate pruinosity, bulbillate. SPORES spherical or nearly so, 9-12 micr. diam. (incl. aculeae), *covered with cylindrical, blunt aculeae,* 2-3 micr. long. CYSTIDIA few or scattered on sides, numerous on edge of gills, subventricose, apex granulate, 40-55 x 8-12 micr. ODOR none.

Gregarious. On the ground in low frondose woods. Ann Arbor. June-September. Rather frequent locally.

This pretty little plant usually occurs in patches of about a dozen. There is a slight rufescent tinge developed as the plant dries. Our specimens had longer and more slender stems as a rule than those shown in Bresadola's figure. *I. rigidipes* Pk. is said to approach it, but to "differ in the tawny-gray color, slightly adnexed lamellae, solid flexuous stem and larger spores." N. Y. State Mus. Bull. 139, p. 59.

Section II. Lacerae. Cuticle of pileus appressed-scaly or fibrillosely-lacerate, not rimose. Stem pallid at first.

**Spores smooth.*

469. Inocybe pyriodora Fr.

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 368.
Bresadola, Fungi Trid., Vol. I, Pl. 52.
Patouillard, Tab. Analyt., No. 528.

PILEUS 3-5 cm. broad, campanulate then plane-expanded and *umbonate*, sometimes irregularly lobed on margin, whitish when

young, *soon dingy ochraceous or pale fuscous-clay color,* at length here and there *faintly stained with pinkish-red,* at first silky-fibrillose, at length appressed fibrillose-scaly, radially split on margin in age. FLESH white at first, slowly pale red where cut, thick on disk. GILLS sinuate-adnexed, medium broad, close, whitish then sordid cinnamon, in age diluted with a rufous tinge, edge white-flocculose. STEM 4-7 cm. long, 4-10 mm. thick, subequal, at the very first white-cortinate, subfibrillose, apex furfuraceus, strict, subbulbous at base, white at first, becoming light-red in age, solid but soon cavernous from grubs. SPORES broadly elliptical, subreniform, smooth, 8-10.5 x 5-6 micr. CYSTIDIA rather abundant on sides and edge of gills, ventricose above the short pedicel, broadly cylindrical above, 45-55 x 12-18 micr. ODOR *sweet,* spicy or like bumble-bee honey, becoming disagreeable.

Gregarious. On the ground in frondose woods of oak, etc. Ann Arbor. August. Infrequent.

This Inocybe is well described by Bresadola, and can be recognized by its peculiar light-red stains, especially between the gills or where they have been removed by snails or slugs. On the cap this color-change is not very marked. The odor has been described as being like that of ripe pears or clove pinks, and is quite characteristic. Except that the pileus is usually fully expanded, Patouillard's figure shows the old stage, which is most often found. The gills are sometimes narrow instead of broad, as indicated by Bresadola.

470. Inocybe scaber Fr.

Syst. Myc., 1821.

Illustrations: Ricken, Die Blätterpilze, Pl. 30, Fig. 1, 1911.
Patouillard, Tab. Analyt., No. 539.
Gillet, Champignons de France, No. 375.

"PILEUS 5-8 cm. broad, conical-campanulate, at length plane and broadly umbonate, *pale smoky,* with smoky, almost overlapping, fibrillose scales, the disk olive-blackish, at times tesselated, at the very first with a white-woolly cortina on margin, *fleshy.* Gills pale clay-color, finally almost smoky, close, broad, ventricose, emarginate-adnate, seceding. STEM 5-8 cm. long, 7-10 mm. thick, solid, subequal, *stout,* pallid or streaked with reddish-brown, silky-fibrillose with a slightly pruinose apex. SPORES almond-shaped, small, 7-8 x 5 micr., *smooth.* CYSTIDIA on sides and edge of gills, flask-

shaped, 50-65 x 15-25 micr., sparse. ODOR weak, somewhat like pears, agreeable."

Reported by Longyear. The description has been adapted from Ricken, who gives the characters most fully. Ricken's diagnosis agrees in microscopic details with most other authors, except that his plants are very large. Patouillard gives the same spores as Ricken, but figures a small plant. Cooke (Ill., Pl. 391) figures a plant whose spores measured 11 x 6 micr. Cooke's spore-size has been copied by Massee and Schroeter. Thus, there seem to be two species at present confused under this name. I have not seen a plant which could be referred to either.

471. Inocybe lacera Fr.

Syst. Myc., 1821.

Illustrations: Ricken, Die Blätterpilze, Pl. 30, Fig. 4, 1911.
Patouillard, Tab. Analyt., No. 531.
Cooke, Ill., Pl. 583.

"PILEUS 3-5 cm. broad, umbonate-expanded, at times depressed, umbo obtuse, *fawn-brown to mouse-gray,* at first almost glabrous-fibrillose, soon fibrillose-scaly, becoming ragged around the umbo; FLESH thin, whitish. GILLS rounded-adnexed, broad, ventricose, subdistant, brownish-clay color, at length concolor. STEM 3-4 cm. long, 4-5 mm. thick, subequal, *brownish,* with red-brown fibrils, *apex naked,* white-mycelioid at base, stuffed, *reddish within.* SPORES almost *cylindrical, long and narrow,* straight, 12-18 x 4-6 micr., smooth. CYSTIDIA on sides and edge of gills, narrow-lanceolate, 54-70 x 14-17 micr., rounded above. ODOR slight; *taste* mild."

Reported by Longyear.

Apparently well-marked by the long, cylindrical spores. Patouillard gives the spores of somewhat different size, 10-13 x 6-7 micr. The above description is adapted from Ricken. An unusual mark of this species is the naked apex of the stem; in most species this is pruinose or scurfy. A form occurred at New Richmond, which agreed except that the spores were the size of those of *I. infelix.*

472. Inocybe infelix Pk. (Poisonous)

N. Y. State Mus. Rep. 32, 1879.

PILEUS 1-2.5 cm. broad, *rather small,* campanulate then ex-

panded-plane, *umbonate,* grayish-brown, *umbo cinnamon or umber,* fibrillose at first, becoming fibrillose-scaly or floccose-scaly, flesh thin, whitish. GILLS adnexed, rather broad, ventricose, close, whitish becoming cinnamon. STEM 2-5 cm. long, 2-3 mm. thick, equal, stuffed, silky-fibrillose, whitish or faintly violaceous at apex, becoming dingy brown below, white within. SPORES *elongated-oblong,* smooth, 10-14 x 4-6 micr. CYSTIDIA flask-shaped, 50-70 x 15-20 micr., apex crystallate. ODOR slight.

Solitary or gregarious. On low, wet ground. Ann Arbor, Bay View. May-July. Frequent.

Scarcely differs from preceding except in size. In those plants which grow in wet places the stem is hollow. Peck says the cuticle of the pileus is more lacerated in wet weather than in dry weather.

473. Inocybe flocculosa Berk.

Eng. Flora.

Illustration: Cooke, Ill., Pl. 393.

PILEUS 1-2 cm. broad, subcampanulate, expanded-umbonate, *tawny-brown with tinge of fuscous,* fibrillose-scaly, not rimose. GILLS rounded-adnate, broad, *ventricose,* almost subdistant, brownish-ashy then concolor, edge fimbriate-crenulate. STEM 1-2 cm. long, 1-2 mm. thick, equal, hollow, pruinose-hoary, scurfy at apex, *tinged brown.* SPORES 8-9 x 4-6, elliptical-ovate, *smooth.* CYSTIDIA on sides and edge of gills, flask-shaped, apex crystallate, about 60 micr. long.

Among spruce needles and on the ground in swamps. Bay View. New Richmond. August.

This little species is usually found in low, wet places. The stem is tinged rufous-brown in most cases.

***Spores angular.*

474. Inocybe decipientoides Pk.

Torr. Bot. Club Bull. 34, p. 100, 1907.

PILEUS 1-4 cm. broad, campanulate-convex, expanded-umbonate, umbo subconic, *silky-floccose,* then scaly-diffracted, dry, brownish-ochraceous; flesh thin, pallid. GILLS adnate, broad, close, whitish

at first then *lurid-cinnamon,* edge white-fimbriate. STEM 4-5 cm. long, 2-5 mm. thick, equal, usually slender, glabrous to subfibrillose, slightly striate, whitish or pallid, apex white-pruinose, base bulbillate, stuffed. SPORES irregularly wedge-shape, subrectangular, etc., *tuberculate,* 9-13 x 5-7 micr. CYSTIDIA on sides and edge of gills, ventricose-elliptical, slender pediceled, 50-60 x 12-18 micr. ODOR and TASTE slight.

Gregarious. On the ground, grassy places in low frondose woods. Detroit. June. Rare.

This is a species very clearly marked by the peculiar spores.

Section III. Rimosae. Pileus radiately fibrous, soon *rimose,* sometimes subscaly or adpressed-scaly.

**Spores smooth.*

475. Inocybe frumentacea Bres.

Fung. Trid., Vol. II, 1892.

Illustrations: Ibid, Pl. 200.
Bres., Fung. Trid., Vol. I, Pl. 87 (as *I. rhodiola* Bres.).
Patouillard, Tab. Analyt., No. 551 (as *I. jurana* Pat.).
Plate XCII of this Report.

PILEUS large, 3-8 cm. broad, rigid-firm, campanulate at first, then expanded and broadly umbonate, fibrillose, becoming rimose or scaly, *fibrils and scales brown-purplish to reddish-chestnut with a dark vinaceous tint,* umbo darker; flesh thick, white, vinaceous under cuticle. GILLS adnexed, at length emarginate-uncinate, close, not broad, thickish, white at first, then grayish-brown, edge white-flocculose, becoming rufescent-spotted. STEM 3-8 cm. long, rather stout, 6-12 mm. thick, equal, terete or compressed, sometimes twisted, fibrillose, apex glabrous or sub-floccose, whitish, *rufous-vinaceous below,* becoming spotted with the same color where handled, solid. SPORES broadly elliptic-subreniform, *smooth,* epispore strongly colored, 10-13 x 6-7 micr. CYSTIDIA none. *Sterile cells* on edge of gills obclavate, or subcylindrical, rounded-inflated above, 45-60 x 9-12 micr. ODOR and TASTE slight, of meal.

Gregarious. On the ground in low places under frondose trees in Belle Isle Park, Detroit and near Ann Arbor. August and July.

This large, wine-colored Inocybe was found in abundance in the above localities during two seasons. It corresponded accurately to the figures of Bresadola, Plate 200, in shape and stoutness. In age or after lying for a day, the characteristic dark vinaceous color becomes more marked. The umbo is broad and in half-expanded caps a gibbous condition is not unusual. It has the appearance of a Tricholoma.

I. jurana Pat. seems to be a distinct plant, although referred to by Bresadola as a synonym of *I. frumentacea.* Our photograph shows the shape and habit well. The pileus is at first conic-elliptical, then campanulate. The stem is more slender than that of *I. frumentacea,* and the spores are smaller, 9-10 x 5-6 micr. There are no cystidia, and the sterile cells on the edge of the gills are of the same size. The other characters are very similar.

Gregarious. On the ground, in low frondose woods. Ann Arbor. August.

476. Inocybe rimosa Pk. (Sense of Ricken)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 371.
Cooke, Ill., Plate 384.
Ricken, Die Blätterpilze, Pl. 30, Fig. 8.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 7.

PILEUS 3-6 cm. broad, oval-campanulate then expanded and obtuse or subumbonate, silky-fibrillose, *at length rimose* and virgate, often split on the margin, *brown,* tinged yellowish in age, margin at length recurved; FLESH pallid, fragile. GILLS almost free, *narrow,* scarcely ventricose, crowded, cinereous-clay color, edge white-fimbriate. STEM 4-8 cm. long, 5-7 mm. thick, equal, straight or curved at base, whitish or pallid, solid, subglabrous, apex white-mealy, *base usually with a marked rounded or subdepressed bulb.* SPORES *short,* reniform, very obtuse at ends, *smooth,* 7-9 x 5-6 micr. CYSTIDIA none; STERILE CELLS on edge of gills, saccate, 30-40 x 12 micr. ODOR after crushing rather strong and nauseous; TASTE disagreeable.

Gregarious. On the ground, in low frondose woods. Ann Arbor. August. Infrequent.

Dark individuals of this species have the appearance of non-scaly forms of *I. destricta* and a microscopic examination is usually necessary to distinguish them. In age the color of different caps

varies considerably in intensity. It is probably widely distributed, but I have few collections. The figure of Patouillard (Tab. Analyt., No. 114) shows the presence of cystidia and belongs elsewhere.

477. Inocybe destricta Fr. (MINOR)

Epicrisis, 1836-38. (As var. *I. rimosa.*)

Illustrations: Fries, Icones, Pl. 108.
Cooke's Ill., Pl. 387.
Ricken, Die Blätterpilze, Pl. 29, Fig. 9.

PILEUS 2-4 cm. broad, conic-campanulate, then expanded-umbonate, at length depressed around the darker abrupt umbo, dark brown, rufous-brown or ochraceous-brown, *umbo persistently dark chestnut* or umber, fibrillose at first, *at length lacerate-scaly or rimose, or both;* FLESH thin, whitish. GILLS sinuate-adnexed or deeply emarginate, uncinate, *ventricose,* medium broad, close to subdistant, whitish then *pale brownish-ashy,* edge white-fimbriate. STEM 2.5-5 cm. long, 2.5-5 mm. thick, equal, scarcely bulbillate, *pallid, tinged with rufous,* varying flocculose-fibrillose to glabrous, apex pruinate, solid, white within. SPORES subreniform, inequilateral, *smooth,* 8-10 x 5-5.5 micr. CYSTIDIA abundant on sides and edge of gills, ventricose, stout above, apex crystallate, 50-65 x 15-18 micr. ODOR at first slight then somewhat nauseous.

Gregarious. On the ground in coniferous forests of pine and hemlock. Bay View, New Richmond. August-September. Frequent.

This is a variable plant, and when developed under moist weather conditions the cap becomes lacerate-scaly and often excoriate in part, and is then non-rimose; in dry weather it becomes markedly rimose and less scaly. When young or freshly expanded the pileus is usually densely fibrillose and its edge minutely appendiculate by the remains of the rather copious, white cortina. At first the pileus is dark brown, but in age it becomes somewhat ochraceous-brown beyond the umbo. The faint tinge of rufous on the older stems is a well-marked character, duly noted by Fries. The spores are markedly subreniform in one view, short fusiform-ovate in the other view. Our collections contain mostly plants with a rather longer stem and narrower cap than shown by the figures of Cooke and Fries. It is easily confused in some of its forms with *I. rimosa,* but differs in possessing abundant cystidia. Occasionally a troop

of dwarf forms occurs, which, however, scarcely differ except in the shorter stem.

478. Inocybe fastigiata Bres.

Fung. Trid., Vol. I, 1881.

Illustrations: Ibid, Pl. 57.
Cooke, Ill., Pl. 383.
Patouillard, Tab. Analyt., No. 343.
Fries, Icones, Pl. 108.
Ricken, Die Blätterpilze, Pl. 31, Fig. 1.
Plate XCIII of this Report.

PILEUS 2-7 cm. broad, *typically very conical or conico-campanulate,* sometimes oval-campanulate, at length subexpanded, *usually with a prominent umbo,* radially fibrillose, *rimose,* virgate, *rich yellowish-fuscous,* ochraceous-tan or straw-color, margin at length split or lobed; FLESH white. GILLS adnexed, becoming sinuate-free, and narrower behind, not broad, ventricose, close, whitish at first, soon tinged *olive or gray,* darker in age. STEM 4-8 cm. long, 4-10 mm. thick, equal or tapering upwards, solid, more or less fibrillose or scurfy, white or slightly fuscescent, sometimes twisted or obscurely striate. SPORES elliptic-subreniform, *smooth* (not angular), obtuse at ends, 9-12 x 5-6 micr. CYSTIDIA none. STERILE CELLS on edge of gills saccate. ODOR strong and disagreeable or entirely lacking.

Gregarious. On the ground, in low, moist places in frondose or conifer woods. Throughout the State. July-September. Frequent.

This is a striking species, and quite variable. The stem may be dull whitish to pale ochraceous. Small forms occur with cap less campanulate and at length papillate. The odor may be very strong or altogether absent. All these forms agree in having the same size spores, gills of the same color and no cystidia. The color of the pileus is sometimes a rich pheasant-yellow, sometimes fulvous-ochraceous, at other times much paler. The English authors, Massee and Berkley, were in error when they assigned rough, nodulose spores to this species. (British Fungus Flora and Outlines.)

479. Inocybe curreyi Berk.

Outlines of Brit. Fung., 1860.

Illustration: Cooke, Ill., Pl. 398.

PILEUS 2-4 cm. broad, irregularly convex-campanulate, obtuse, not umbonate, gibbous at times, appressed-fibrillose, at length rimose, *pale tawny-yellowish,* edge undulate; FLESH white. GILLS slightly adnexed, rather broad, close, *becoming smoky-olivaceous,* edge white-fimbriate. STEM 2-4 cm. long, variously curved, *tapering upward from a subclavate base,* not bulbous, solid, slightly fibrillose, glabrescent, whitish at first, furfuraceus-scaly at apex. SPORES elliptic-subreniform, obtuse at ends, 7-9.5 x 5-5.5 micr., *smooth,* fuscous-cinnamon in mass. CYSTIDIA none. STERILE CELLS on edge of gills saccate. ODOR strongly earthy when crushed.

Gregarious. On the ground among grass in frondose woods. Ann Arbor. July-August. Not infrequent.

This plant is referred to this form with some hesitation as published details of Berkley's species, especially as to the microscopic characters, are insufficient. The color of the pileus approaches *I. fastigiata* rather closely, but it is not conical nor truly umbonate, and the spores are constantly smaller. From the following it is distinguishable by the very different form of the stem and by the color of the pileus. Patouillard gives the spores 6 x 4 micr., in which he is quite at variance with the British authors.

480. Inocybe cookei Bres.

Fung. Trid., Vol. 2, 1892.

Illustration: Ibid, Pl. 121.

PILEUS 1.5-4 cm. broad, subconic-campanulate, expanded-umbonate, silky-fibrillose, at length rimose, glabrous on center, *straw-yellow, becoming sordid lutescent,* margin at length wavy or split; FLESH whitish. GILLS sinuate-adnexed or almost free, scarcely ventricose, narrow, close, whitish at first, soon tinged ashy-ochraceous-cinnamon, edge white-fimbriate. STEM 2.5-5 cm. long, 3-5 mm. thick, equal, solid, silky-fibrillose, pruinose at apex, *with a marginate distinct bulb,* whitish at first, *lutescent.* SPORES 8-9.5 x 4.5-5.5 micr., elliptic-subreniform, obtuse at ends, *smooth.*

CYSTIDIA none. STERILE CELLS on edge of gills, inflated-obclavate, 30 x 12-15 micr.

Gregarious. On moist ground in frondose and coniferous woods. Ann Arbor, Bay View, New Richmond. August-September. Infrequent.

The uniform pale yellow color of the pileus which becomes deeper in age, the lutescent stem and margined bulb are characters which separate this from the two preceding species. The odor is scarcely noticeable at times but occasionally it is rather strong of rancid meal.

481. Inocybe lanotodisca sp. nov.

PILEUS 2-4 cm. broad, rarely broader, convex-campanulate, obtuse or broadly umbonate, ground-color pale ochraceous-brownish or pale tawny, *at first covered by a white, mouldy-like silkiness on the center, when expanded subzonate by the subconcentric arrangement of the downy-silky fibrils,* at length rimose; FLESH white, rather thick on disk. GILLS adnexed-emarginate, moderately broad, close, at length cinereous-alutaceous, edge white-fimbriate. STEM 3-5 cm. long, 4-6 mm. thick, equal or subequal, solid, glabrescent, apex pruinate-scaly, white, becoming pale sordid yellowish in age. SPORES elliptic-subreniform, *smooth,* obtuse at ends, 9-10.5 x 5-6 micr. CYSTIDIA none. STERILE CELLS on edge of gills, obclavate, attenuated downward. BASIDIA clavate, 33 x 9 micr., 4-spored. ODOR nauseous on crushing the plant.

Gregarious to subcaespitose. On the ground in low frondose woods. Ann Arbor. August-September. Infrequent.

A well-marked species; to be known by the hoary-silkiness on the central portion of the pileus and by the lack of cystidia. It approaches *I. sindonia* in appearance, but that species has abundant cystidia, the cap is not rimose, and the covering of the pileus is differently disposed. The habit varies from rather slender forms to those quite stout. As the pileus expands the white fibrils are disposed over a larger area.

482. Inocybe eutheloides Pk.

N. Y. State Mus. Rep. 32, 1879.

PILEUS 1-2.5 cm. broad, conico-campanulate, then expanded-umbonate, *fawn-color to grayish-fawn,* darker to chestnut when

young or on the *distinct umbo,* silky-fibrillose, at length rimose, sometimes appressed-scaly. GILLS adnexed, rather broad, ventricose, close, whitish then brownish-cinnamon, white-fimbriate on edge. STEM 2-5 cm. long, 2-4 mm. thick, equal, subbulbillate at base, solid, densely white-fibrillose when young, subglabrescent, apex scurfy-pruinate. SPORES 8-10 (rarely longer) x 4.5-5.5 micr., variable in shape, subreniform-fusoid, ends somewhat narrowed, *smooth.* CYSTIDIA *rather abundant* on sides and edge of gills, narrowly flask-shaped, apex crystallate, 50-70 x 12-16 micr. BASIDIA 30 x 9 micr., 4-spored. ODOR slight.

Gregarious. Common in southern Michigan; on the ground in low frondose woods. June-September.

This is closely allied to *I. destricta,* form *minor,* in its microscopic characters. The colors are, however, constantly distinct, and *I. destricta* seems limited to coniferous regions. *I. eutheloides* also approaches *I. eutheles* as interpreted by some authors, e. g., Massee. But according to Patouillard that species is devoid of cystidia. The stem is usually markedly silky-fibrillose, and the umbo is dark chestnut in young and fresh specimens. In young specimens the margin of the pileus is often crenately fringed by the white cortina.

***Spores angular-tuberculate.*

483. Inocybe radiata Pk. (Poisonous)

Torr. Bot. Club Bull. 22, p. 488, 1895.

PILEUS 1.5-5 cm. broad, campanulate, fuscous-brown to ochraceous-brown, *very umbonate by an obtuse, dark umber umbo,* which remains glabrous, elsewhere appressed-fibrillose with brown fibrils, not at all viscid, becoming rimose; FLESH white, thickish on disk. GILLS *adnate,* broad, at length sinuate-uncinate, close, becoming ochraceous-cinnamon to subferruginous, edge white, flocculose. STEM 3-6 cm. long, 2-4 mm. thick, equal, stuffed, silky-fibrillose, *becoming umber-fuscous-brown,* apex paler, subbulbillate and white-myceliod at base. SPORES irregularly oblong-rectangular to subwedge shape in outline, angular and with few scattered tubercles, 7-9 x 5-6 micr. CYSTIDIA few or scattered, on sides and edge of gills, 55-65 x 12-18 micr., broadly ventricose, apex somewhat pointed and crystallate, on slender pedicel. ODOR earthy. TASTE mild.

Gregarious. On the ground, in frondose woods. August. Ann Arbor.

This seems to be intermediate between *I. carpta* Bres. and *I. umbrina* Bres. in its microscopic characters. The umbo does not become warty nor scaly and is not subviscid as in the latter species. The same species has been received from Massachusetts; it was sent by Simon Davis, who reports it poisonous.

484. **Inocybe fibrosa** Bres. (Poisonous)

Fung. Trid., Vol. I, 1881.

Illustrations: Ibid, Pl. 56.
Cooke, Ill., Pl. 454.
Ricken, Die Blätterpilze, Pl. 29, Fig. 8.
Plate XCIV of this Report.

PILEUS 4-8 cm. broad, *large,* obtusely campanulate, then broadly umbonate and expanded, dry, *creamy-white or tinged straw-color,* sometimes ochraceous-stained, silky, at length rimose and margin lobed, split or recurved; FLESH white, *thick,* thin on margin. GILLS free, rounded behind, *ventricose,* broader toward front, close, whitish at first, then ashy-cinnamon, edge white-fimbriate. STEM 4-8 cm. long, 6-15 mm. thick, fibrous, splitting longitudinally, subequal, striatulate to subsulcate, glabrescent, apex pruinate, white then sordid, base often subbulbous. SPORES angular-oblong, *with obscure, scattered tubercles,* 9-13 x 5-7 micr., epispore reddish under the microscope. CYSTIDIA fusoid, crystallate at apex, abundant on sides and edge of gills, 60-75 x 10-15 micr. ODOR earthy. TASTE mild.

Gregarious. On the ground, in low, moist, frondose woods. June-August. Ann Arbor. Infrequent.

Apparently our largest species. The spores are inclined to be more or less sinuate-tuberculate, but the angularity is not as marked as in many others. The character of the surface of the pileus is much like *I. fastigitata* except in color. It appears earlier than most Inocybes, and is said to be *poisonous.* (See Bresadola, Fung. Trid.)

485. Inocybe albodisca Pk.

N. Y. State Mus. Rep. 51, 1898.

PILEUS 1.5-3.5 cm. broad, conical at first, soon campanulate-umbonate or expanded, *umbo lubricus-glabrous, obtuse and whitish,* elsewhere silky, at first pale lilac-flesh color, at length *grayish-drab* and rimose; FLESH whitish, not changing color. GILLS rather narrow, close, narrowly adnate, whitish at first, then subferruginous, edge minutely white-flocculose. STEM 3-5 cm. long, 3-5 mm. thick, equal, subbulbillate to somewhat marginate-bulbous, solid, *glabrous* or upper part pruinate, at first tinged by color of pileus, fading, even. SPORES *sinuate-angular,* subrectangular to subglobose in outline, shape variable, 7-8 x 5-6 micr., nucleate. CYSTIDIA very abundant on sides and edge of gills, crystallate at apex, fusoid-ventricose, about 50 x 15 micr. Basidia 33 x 9 micr., 4-spored. ODOR slight, subnauseous.

Gregarious-scattered. On the ground, clay soil of hemlock and beech woods. New Richmond. September. Infrequent.

Known by its glabrous, whitish, obtuse umbo, submarginate bulb, and the peculiar shade of pale lilac-incarnate color when young. This color disappears in older specimens where the cap takes on a grayish shade and becomes rimose. The spores distinguish it sharply from *I. lanatodisca,* and the smaller size of the plant and spores separate it from *I. fibrosa.* It is closely related to *I. umbratica* Bres. and *I. fallax* Pk.

486. Inocybe asterospora Quel.

Bull. Soc. Bot. France, Vol. 26, p. 50, 1879.

Illustrations: Ricken, Die Blätterpilze, Pl. 29, Fig. 1.
Cooke, Ill., Pl. 385.
Patouillard, Tab. Analyt., No. 546.

PILEUS 2-5 cm. broad, conic-campanulate to convex-umbonate, brown or rufous-brown, *very rimose,* fibrillose-scaly; FLESH pallid, rather thin. GILLS narrowly adnate, emarginate, ventricose, close, at length olivaceous-cinnamon or grayish-brown. STEM 4-6 cm. long, 2.5-6 mm. thick, equal above the submarginate or rounded bulb, *rufescent,* innately striatulate, *mealy-pubescent,* fibrous, solid. SPORES subsphoeroid, slightly longer than broad, covered with

blunt, subcylindrical tubercles which are broader toward base, 9-11 micr. CYSTIDIA abundant on sides and edge of gills, 50-75 x 15-24 micr., ventricose, apex crystallate. ODOR slight or subnauseous.

Gregarious. In low, sandy, frondose woods. Ann Arbor. June-August.

It is rather difficult to keep *I. asterospora* and *I. calospora* distinct. The rimose and scaly characters by which they are set apart may vary under certain weather conditions so as to be obliterated. The spores are very similar, but those of *I. asterospora* are not as truly spherical as in *I. calospora*. With us this species tends to be smaller than the figures show it. It is at once separable from the other red-brown species by the spiny-tuberculate spores.

Section IV. Velutinae. Pileus not rimose, cuticle of interwoven fibrils, glabrescent or appressed-scaly.

**Spores angular-tuberculate.*

487. Inocybe repanda Bres.

Fung. Trid., Vol. II, 1892.

Illustrations: Ibid, Pl. 119.
Plate XCV of this Report.

PILEUS 3-5 cm. broad, obtusely conic-campanulate, then expanded and broadly umbonate, umbo fulvous and glabrous, *elsewhere covered with orange-fulvous fibrils on a whitish foundation,* sublubricous, margin at length split or subrimose, sometimes scaly-cracked. FLESH white, rather fragile, thick on disk. GILLS adnexed or almost free, broad, subventricose, close, at first white, *rufescent,* finally argillaceous-cinnamon, edge white-fimbriate. STEM 3-6 cm. long, strict, 5-6 mm. thick, equal above the abrupt or rounded bulb, stuffed, terete, even, slightly silky fibrillose, *the fibrils fulvous-tinged toward base,* apex white-pruinose. SPORES angular, 7-9.5 x 6-7 micr., longer than wide, sometimes rectangular in outline, *with minute papillate tubercles.* CYSTIDIA moderately abundant on edge and sides of gills, ventricose-fusiform, apex crystallate, 60-75 x 12-18 micr. ODOR and TASTE mild.

Gregarious. On the ground, in low frondose woods. Ann Arbor. July-August. Infrequent.

This is one of our larger Inocybes and is well-marked. The flesh

does not readily become rufescent in our plants, yet there is little doubt that the plant is the one described by Bresadola.

****Spores smooth.***

488. Inocybe sindonia Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 400.
Ricken, Die Blätterpilze, Pl. 30, Fig. 7.

PILEUS 2-6 cm. broad, at first obtusely conic-oval, then campanulate-expanded and *broadly umbonate, cortinate, at first woolly-fibrillose from dense white fibrils,* later subglabrescent, not rimose, *whitish* becoming straw-yellow to dingy ochraceous in age. FLESH compact, thick on disk, white. GILLS emarginate-adnexed or almost free, moderately broad, ventricose, close, at first pale grayish-white then grayish-clay color. STEM 3-6 cm. long, 4-9 mm. thick, equal above the subemarginate bulb, *white,* stuffed, often striate, silky shining, at first fibrillose, flesh satiny-shining. SPORES subreniform, *smooth,* relatively broad, 8-10 x 5-6 micr. CYSTIDIA abundant on sides and edge of gills, ventricose-lanceolate to subcylindrical, apex crystallate, 60-75 x 15-20 micr. ODOR rather strong, somewhat nauseous.

Gregarious. On the ground, in low, rich, frondose woods. Ann Arbor. August-September. Infrequent.

Without an examination of the microscopic characters, this species might easily be confused with *I. lanatodisca.* In the young stage the white woolly-fibrillose cortina is continuous with the fibrils on the margin of the cap. At maturity the pileus becomes glabrous, especially on the disk, while in *I. lanatodisca* the disk is marked at last by the white fibrils. It is probable that Hard's Fig. 218, p. 269, Mushroom Book, of *I. subochracea* var. *burtii* Pk. is referable to this species.

489. Inocybe subochracea Pk.

N. Y. State Mus. Rep. 23, 1872 (as Hebeloma).

Illustration: N. Y. State Mus. Rep. 54, Pl. H. (as var. *burtii*).

PILEUS 2-3.5 cm. broad, *conical at first,* then convex-campanulate, umbonate, *ochraceous or ochraceous-yellow,* appressed fibril-

lose subscaly, darker and more scaly on disk, *not rimose*. FLESH *white, thin*. GILLS sinuate-adnexed, scarcely close, moderately broad, whitish then pale ochraceous-brown to rusty-brown. STEM 2.5-5 cm. long, 2-4 mm. thick, *equal*, solid, subglabrous, whitish, pallid ochraceous in age. SPORES broadly elliptic-subreniform, 7-9 x 4.5-5 micr., *smooth*. CYSTIDIA scattered on sides and edge of gills, apex crystallate, lanceolate, stipitate, *yellowish*, 70-90 x 12-20 micr. ODOR and TASTE mild.

Gregarious. On the ground, frondose woods. August-September. Ann Arbor.

This species has a smaller and more yellowish pileus than *I. sindonia;* the spores and cystidia are similar. A variety has been described by Peck with a distinct, webby cortina and more fibrillose stem, as var. *brutii*.

490. Inocybe geophylla Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 401.
Gillet, Champignons de France, No. 364.
Patouillard, Tab. Analyt., No. 228.

PILEUS 1.5-2.5 cm. broad, conical at first, then expanded-umbonate, *very silky and glossy, white or whitish*, not rimose; FLESH white, thin. GILLS adnexed, close, rather broad, ventricose, whitish then pale grayish-clay color. STEM 2-5 cm. long, 2-3 mm. thick, slender, equal, firm, stuffed, *white*, silky, apex pruinose. SPORES elliptic-subreniform, *smooth*, 8-9 x 5 micr. CYSTIDIA fusiform, 40-55 x 12-15 micr. ODOR "slightly nauseous."

Gregarious or scattered. On the ground in frondose and conifer woods. Throughout the State. July-October. Common.

One of our commonest Inocybes, although not often found in abundance at one place. The clear, white, glossy cap and stem are characteristic. Other white species which have been described are: *I. comatella* Pk., a smaller plant, which has a hairy pileus and at times a reddish-brown stem, but the spores and cystidia are the same, usually grows on rotten wood; *I. fallax* Pk., with angular or nodulose spores; *I. infida* Pk., also with nodulose spores and a subscaly, reddish-brown umbo. Both the latter species have cystidia.

491. Inocybe lilacina (variety of preceding by authors)

Illustrations: Patouillard, Tab. Analyt., No. 545.
Ricken, Die Blätterpilze, Pl. 30, Fig. 2.
Hard, Mushrooms, Fig. 219, p. 270, 1908.

PILEUS lilaceous-violet, the umbo darker, almost smoky-purple at first. STEM pale lilac-violaceous to whitish. Otherwise like *I. geophylla.*

Gregarious. On the ground, in frondose and conifer woods. Throughout the State. August-October. Less frequent than *I. geophylla* Fr.

This is a pretty little plant, and is usually combined with *I. geophylla.* It is usually found in gregarious groups of several individuals and not mixed with *I. geophylla.* This fact and its constantly independent color, leads me to believe that it does not arise from the same mycelium as *I. geophylla.* The general appearance during development and the character of the surface of the cap, although not easily differentiated in words, seem sufficiently different from the white species.

492. Inocybe scabella Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 110, Fig. 1.
Bresadola, Fung. Trid., Vol. I, Pl. 86, Fig. 1.
Patouillard, Tab. Analyt., No. 229.

PILEUS 1.5-2.5 cm. broad, conico-campanulate, then expanded and *with a naked, glabrous, obtuse, rather small umbo,* silky elsewhere, dry, cinnamon-brown to sordid alutaceous, at length minutely appressed-fibrillose-scaly. FLESH thin, pallid. GILLS sinuate-adnexed, *subdistant, ventricose,* pale grayish-white, then sordid cinnamon, edge white-fimbriate. STEM 2.5-3.5 cm. long, 2-4 mm. thick, equal, stuffed, subfibrillose, *soon glabrescent, pallid or slightly fuscous, slightly rufous upwards.* SPORES almond-shaped, almost golden-yellow in microscope, *smooth,* 10-13 x 5-6 micr. CYSTIDIA fuscoid-ventricose, on sides and edge of gills, apex crystallate, 60-70 x 13-14 micr. ODOR slightly rancid-subfarinaceous. TASTE sweetish.

Var. *rúfa:* Whole plant pale rufous to sordid brick color. STEM more slender, 5-6 cm. long, 1-2 mm. thick. SPORES inequilateral,

elongated-elliptic, subacute at ends, smooth. CYSTIDIA abundant, ventricose flask shaped.

Gregarious. The variety is common in swampy or mossy wet places on rich soil, of cedar and hemlock woods. It scarcely differs except in color from the typical form as described by Bresadola. The wet habitat easily accounts for the more slender stem. The color, however, is constant in young and old plants, or may become brownish on the cap. The typical form is less easily distinguished, and approaches *I. trechispora,* an angular-spored species. In fact, Bresadola has pointed out that Patouillard's figure No. 547, and Cooke's Plate 402 are illustrations of *I. trechispora.* June-September. In coniferous regions. Houghton, Bay View, New Richmond.

Section V. Viscidae. Pileus viscid, more or less silky when dry.

**Spores angular-tubercular.*

493. Inocybe trechispora Berk.

Outlines of Brit. Fung., 1860.

Illustrations: Ibid, Pl. 8, Fig. 6.
Cooke, Ill., Pl. 403 (Pl. 402 as *I. scabella*).

PILEUS 2-2.5 cm. broad, convex, expanded-umbonate, *viscid,* silky when dry, *umbo tawny* and naked, elsewhere tawny-ochraceous and paler. GILLS sinuate-adnexed, moderately broad, ventricose, close, white then grayish-brown, edge white-fimbriate. STEM 2.5-5 cm. long, 2-3 mm. thick, subequal, usually tapering upwards, *marginate-bulbous at base,* glabrous, apex pruinose, solid, *white.* SPORES tubercular-angular, slightly longer than wide, irregular in outline, 6-8 x 4-6 micr. CYSTIDIA ventricose, flask-shaped, 50 x 16-18 micr., apex crystallate and obtuse.

Gregarious. On the ground, among debris, in conifer swamps. Houghton, Bay View, New Richmond. August-September. Infrequent.

A small species, known by its viscid pileus with shining, naked and tawny umbo, by the rather abruptly marginate bulb of the stem and by the tuberculate spores. Our plant agrees with Berkeley's species in the spore character as given by Massee. Ricken has applied the name to a plant with spores 14-15 x 6-7 micr.

***Spores smooth.*

494. Inocybe glaber sp. nov.

PILEUS 1.5-3.5 cm. broad, at first narrowly elliptic-oval, then campanulate-expanded and umbonate, *umbo glabrous-sublubricous,* sordid ochraceous-brown or livid-brown, at length darker on margin, paler on umbo, at first glabrous, at length subfibrillose, moist and shining, *becoming soft and fragile in moist weather.* FLESH thin. GILLS almost free, rather narrow, close, pallid then pale fuscous-brown, edge white-fimbriate. STEM 3-5 cm. long, 2.5-4 mm. thick, equal above the bulbillate base, glabrous, even, solid, white or pallid. SPORES subreniform, *smooth,* 7-9 x 4-5 micr. CYSTIDIA *none.* STERILE CELLS on edge of gills subcylindrical to rounded-enlarged at apex. ODOR nauseous to slightly radishy.

Gregarious. On the ground, in low frondose woods. Saginaw, Ann Arbor. July-September. Infrequent.

This species approaches the genus Hebeloma in some of the characters. The pileus becomes soft and watery at maturity and is easily crushed, and the odor is obsoletely of radish. The shape of the young pileus is however distinctly Inocybe-like, and the plants were found growing with a number of other Inocybes. It seems to approach *Hebeloma discomorbidum* Pk., but lacks the reddish tint on the cap, the hollow stem and the spores of that species. It is not truly viscid, even in moist weather, although the umbo is somewhat lubricous.

Hebeloma Fr.

(From the Greek, *hebe,* the vigor of youth, and *loma,* a fringe, referring to the presence of the cortina in the young plant.)

Ochre-brown-spored. Stem continuous with the pileus, *without a membranous annulus;* fleshy to fibrous; *partial veil in the form of a fibrillose cortina or lacking; no volva;* gills adnexed or emarginate; pileus *viscid or subviscid,* its margin at first incurved; *spores alutaceous,* never ferruginous.

Putrescent, *terrestrial,* often with a strong odor. They approach the terrestrial Pholiotas on the one hand, but without the membranous annulus, and Inocybe, Flammula and Cortinarius on the other. Inocybe differs in its silky or fibrillose-scaly pileus and verrucose-pointed cystidia; Flammula, in its non-emarginate, sub-

decurrent or broadly adnate gills, and mostly lignicolous habit; Cortinarius, in having a more delicately woven, spider web-like cortina and darker brown to ferruginous spores. Hebeloma corresponds to the genus Tricholoma of the white-spored group. Their *edibility* is not established and a number of species are under suspicion.

The PILEUS is glabrous, somewhat viscid, mostly with pale colors: whitish, tan, brownish, dingy ochraceous or rufous, often with shades of these colors variously distributed. The small amount of variation in the colors of different species makes it difficult to become rapidly acquainted with them, and often one has to rely on somewhat minute or variable characters to distinguish them. The young plants should always be examined for the fibrillose *veil or cortina* which disappears in most mature specimens and which is entirely wanting in one section. The viscidity should also be established before referring a plant to this genus since this is hardly noticeable in dry weather. The GILLS at length become emarginate, and this character, as in the genera Tricholoma and Entoloma, limits the genus. Variations sometimes occur in individual specimens, where the gills are adnate-decurrent or arcuate, and hence a single specimen is very unsatisfactory for a definite diagnosis. The edge of the gills is sometimes minutely fimbriate on account of the long sterile cells or cystidia and in a few species the edge distills drops of liquid which give it a beaded appearance under a lens; in many cases the edge remains white or whitish after the spores have colored the rest of the gills. The STEM often has a distinct outer, fleshy or fibrous rind which varies in thickness, while the interior, which is of varying diameter in different species, is stuffed by a white pith. While the stem is developing this pith breaks down leaving a hollow axis, although in some species the pith persists a long time. When no pith is present, the stem is said to be *solid* and is then composed of a fibrous texture which does not disappear. In both cases, however, grubs nearly always hollow out the stem at maturity, a condition which must be clearly distinguished from the term "hollow stem," which is not applied in that case. The SPORES are usually pale in color, ochraceous, brownish or alutaceous, coloring the mature gills a similar shade. The paler color of the gills and spores usually provides the means of separation from the genus Cortinarius. The shape of the spores varies but is generally elliptical-ovate, inequilateral and apiculate at one end; they are almost smooth except in a few species in which they are obscurely rough. CYSTIDIA are rather rare in this genus on the

sides of the gills, *H. albidulum* being the only one known to me with cystidia. *Sterile cells,* usually elongated beyond the hymenium, are found on the edge of the gills, and furnish important microscopic details for the certain identification of many of the species of this genus. Their shape and size vary, and at maturity they give to the edge of the gills a white, fimbriate or flocculose appearance. The ODOR is often like that of radish, especially when the flesh is rubbed or bruised. The TASTE also is sometimes radishy or bitter and disagreeable. McIlvaine, who studied the *edibility* of so many mushrooms, has given us little information on this genus. Some are probably poisonous, and as far as known, even where a species has been proved harmless, the taste when cooked is not found to be appetizing, so that the Hebelomas are hardly to be considered of much value for the table. This is a difficult genus for the amateur, and much uncertainty is prevalent, even in the minds of mycologists, as to the limits of the species.

The genus may be divided into two sections, those with a cortina when young, Indusiati; and those without a visible cortina, Denudati. It does not seem to me that Fries' section "Pusilli," which included the smaller species, is a satisfactory grouping, and the species which have been placed in "Pusilli" are distributed under Indusiati and Denudati. Even the two divisions retained run into each other imperceptibly.

Key to the Species

(A) Stem solid, rarely becoming cavernous.
  (a) Cortina present when young.
    (b) Edge of gills beaded with drops in moist weather; pileus pale yellowish-tan; odor of radish. 496. *H. fastibile* Fr.
    (bb) Edge of gills not beaded.
      (c) Cystidia numerous on gills; spores 6-7 x 3-4.5 micr.; gills arcuate-adnate, rather narrow; pileus yellowish-tan, etc. (See 513. *Flammula lenta.*)
      (cc) Cystidia lacking; spores larger.
        (d) Pileus conical when young, 2-3 cm. broad, pale yellowish, clay-color, darker on disk; stem slender. 497. *H. mesophaeum* Fr.
        (dd) Pileus soon convex, umbonate or subumbonate.
          (e) Growing in open woods, fields, bare places, etc.; pileus 2-5 cm., brownish-clay-color, rufescent. 499. *H. pascuense* Pk.
          (ee) In coniferous woods; pileus 5-7 cm., mature gills dark. *H. firmum* Fr.
  (aa) Cortina not present.
    (b) Stem stout, scaly-torn, white; pileus large, sordid grayish-brown to pale tan, odor of radish. 500. *H. sinapizans* Fr.
    (bb) Stem flexuous, silky fibrillose, base enlarged by adhering sand; pileus alutaceous to tan. 508. *H. colvini* Pk.

(AA) Stem stuffed by a pith, or hollow.
(a) Cortina present at first.
(b) Pileus glutinous (wet), sprinkled with superficial white scales. *H. glutinosum* Fr. (See also *Flammula lenta.*)
(bb) Pileus glabrous; gills whitish at first; odor of radish.
(c) Cortina cottony-fibrillose, somewhat persistent on stem or on margin of pileus; pileus chestnut, reddish-gray or grayish. 495. *H. velatum* Pk.
(cc) Cortina fugacious; pileus brick-red to reddish-ochraceous; spores 10-13 x 6-7 micr. *H. testaceum* Fr.
(ccc) Cortina fugacious; stem slender; pileus 2-3 cm. broad, pale ochraceous-tan. 498. *H. gregarium* Pk.
(aa) Cortina not present.
(b) Gills bright flesh-colored or pink, turning brown only in extreme age; pileus chalk-white to dingy-white. 506. *H. sarcophyllum* Pk.
(bb) Gills not pinkish.
(c) Edge of gills beaded with drops in moist weather; odor strong; pileus pale tan, darker on disk. 501. *H. crustuliniforme* Fr.
(cc) Edge of gills not beaded.
(d) Stem short, 2-4 cm. in length.
(e) Spores 12-13 x 6-7 micr.; pileus pale tan. 502. *H. hiemale* Bres.
(ee) Spores 6-9 x 4-5 micr.
(f) Pileus brick-red (moist), umbonate; spores 7-9 x 4-5 micr. 510. *H. magnimamma* Fr.
(ff) Pileus yellowish-white, not umbonate; in pastures, etc. *H. sociale* Pk.
(dd) Stem long and rather stout in normal specimens, white.
(e) Stem bulbous; cystidia long, slender, cylindrical; pileus whitish. 504. *H. albidulum* Pk.
(ee) Stem equal or attenuated downward.
(f) Stem fragile, partially hollow; pileus whitish to tan; odor not of radish. 503. *H. longicaudum* Fr.
(ff) Stem firm.
(g) Pileus white or whitish, tinged tan.
(h) Gills narrow, adnexed; pileus white; spores 12-16 x 6-8 micr. 507. *H. album* Pk.
(hh) Gills rather broad, adnate at first; sterile cells on edge of gills clavate-thickened at apex; stem floccose; spores 11-13 x 6-7 micr. 505. *H. simile* sp. nov.
(gg) Pileus darker colored.
(h) Gills intervenose, costate; pileus ochraceous to tawny-ochraceous; edge of gills with clavate, sterile cells. Spores 12-15 x 7-8 micr. *H. neurophyllum* Atk.
(hh) Gills not costate; pileus tinged reddish to ferruginous, with a viscid separable pellicle; spores 9-11 x 5-6 micr. 509. *H. syrjense* Karst.

Section I. Indusiati. Cortina present in young stage.

495. Hebeloma velatum Pk.

N. Y. State Mus. Bull. 139, 1909.

PILEUS 2-6 cm. broad, bullate-convex at first, then expanded, obtuse or umbonate, viscid (moist), glabrous, *becoming appressed-*

silky on drying, livid-bay, fading to tan with reddish disk, *margin decorated by the remains of cortina*, even. FLESH white, thin, hygrophanous, soft and pliant. GILLS adnexed-seceding, close, rather narrow, subventricose, whitish then alutaceous, edge minutely white-fimbriate. STEM 3-6 cm. long, 4-6 mm. thick, equal, stuffed then hollow, *white at first then dingy ochraceous*, fibrous-fleshy, flexuous, twisted at times, pruinose-floccose at apex, *floccose above middle from the subpersistent cortina*, at length fibrillose, splitting longitudinally in age. SPORES 10-12 x 5-7 micr., narrowly elliptic, acute at one end, subobtuse at distal end. CYSTIDIA none; sterile cells on edge of gills short, slender, 30-45 x 6 micr. ODOR and TASTE slight.

Gregarious. Ground, in mixed woods. New Richmond. September. Infrequent.

Peck says it is very variable in color and in the development of the cortina. Sometimes a distinct annulus adheres to the stem and is then easily mistaken for a Pholiota, other specimens show a slight development of the cortina. The odor of radish was slight in our specimens and the gills were hardly ventricose and rather narrow. It appears as a plant of small stature at times. The colors of the pileus, the rather floccose stem, and the short sterile cells of the gills distinguish it.

496. **Hebeloma fastibile** Fr. (Suspected)

Syst. Myc., 1821. Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 111.
Patouillard, Tab. Analyt., No. 342.
Ricken, Blätterpilze, Pl. 32, Fig. 1.

PILEUS 3-7 cm. broad, compact, convex-plane, often wavy, obtuse, viscid (moist), glabrous, *yellowish-ochraceous to alutaceous-whitish*, margin pubescent and incurved. FLESH white. GILLS *emarginate, subdistant*, unequal, whitish then argillaceous-cinnamon, *edge* white-fimbriate and *beaded with aqueous drops in moist weather*. STEM 4-6 cm. long, 5-10 mm. thick, solid or slightly hollow, *firm*, bulbous, fibrillose, *white*, decorated above by the remains of the cortina which is sometimes annular. SPORES 10-12 x 5-6 micr., elliptical-ovate, smooth. CYSTIDIA clavate. ODOR *disagreeable*. TASTE *bitter*.

Gregarious. In woods. New Richmond, etc. Frequency unknown. September.

The beaded gills, color of pileus, subdistant to distant gills, odor and taste are the distinguishing features. The odor is somewhat of radish.

497. Hebeloma mesophæum Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 411.
Ricken, Blätterpilze, Pl. 32, Fig. 3.

PILEUS 1-3 cm. broad, *campanulate or subconical at first,* then convex-expanded and subumbonate, sometimes wavy on margin, slightly viscid, buff to whitish on margin, brownish to chestnut or rufous on disk, glabrous, silky-shining, even, the margin at times decorated with the delicate remnants of the dingy-white cortina. GILLS soon emarginate, adnate, close, rather broad, whitish at first then pale rusty-alutaceous, edge white-fimbriate. STEM 4-6 cm. long, 3-5 mm. thick, mostly slender, fleshy-fibrous, *equal, silky-fibrillose*, sometimes twisted, mealy at apex, whitish, becoming dingy, with a small tubule. ODOR and TASTE slight.

Gregarious to subcaespitose. On sandy ground among grass or on bare ground in woods, fields, etc. Ann Arbor. October. Sometimes frequent.

Known by its rather small, subconical pileus when young, its tough, equal stem, peculiar cast to the pileus and lack of a distinctive odor. The spores are rather larger than the size given by Massee, but otherwise it agrees well with Fries' description. The stem is at first solid but develops a slight tubule in age. It differs from *H. hiemale* in the presence of a cortina which sometimes forms a slight, fugacious ring on the stem. Dried, the cap and stem remain whitish-tan. The surface of the cap is often quite silky. Ricken says it is known by its rusty-brown flesh when old, a character I have not noticed.

498. Hebeloma gregarium Pk.

N. Y. State Mus. Rep. 49, 1896.

PILEUS 1.5-3 cm. broad, *convex*, obtuse, slightly viscid, isabelline to ochraceous-tan, sometimes darker on disk, glabrous, even.

FLESH rather thin, *whitish.* GILLS adnate at first, then emarginate, close, thin, rather broad, subventricose, whitish at first then rusty-cinnamon. STEM 4-10 cm. long, 2-4 mm. thick, slender, equal, *stuffed then hollow,* subcartilaginous, fibrillose below, slightly mealy at apex, pallid, at length dingy-brown. SPORES 9-12 x 5-6 micr., variable, elliptical, smooth, alutaceous-cinnamon in mass. CYSTIDIA none. ODOR strong, radishy or almost lacking. TASTE slightly disagreeable. CORTINA scanty, fibrillose, evanescent.

(Dried: Pileus rusty-tan to brown, gills cinnamon-brown, stem sordid brownish.)

Gregarious. Under shrubbery or trees, on lawns, etc. Ann Arbor, East Lansing. May, June, September, October. Infrequent.

This species is closely related to *H. mesophaeum.* Its spores are the same, and usually it has a similar stature. As far as I can see, *H. gregarium* is distinguished from *H. mesophaeum* only by its darker gills and spores, its truly convex pileus and sometimes by its odor. Specimens identified by Peck as his species were compared with the above. It has been reported by Peck and others as occurring in October and November although I have seen it also in early spring, a seasonal distribution quite frequent in the case of certain species of mushrooms. Its cortina and general appearance suggest a Cortinarius; it is clearly not distantly related to that genus and I suspect has been referred to it more often than to Hebeloma. On drying it becomes much darker than *H. mesaphaeum,* as the latter is diagnosed above. It has slender sterile cells on the edge of the gills.

499. Hebeloma pascuense Pk.

N. Y. State Mus. Rep. 53, 1900.

Illustrations: Ibid, Pl. C, Fig. 21-27.
Hard, Mushrooms, Fig. 222, p. 274.

PILEUS 2-5 cm. broad, convex then plane, obtuse, viscid when moist, *brownish-clay color,* tinged rufous on disk, becoming pale (dry), subhygrophanous, glabrous, *innately streaked* or *variegated by fibrils,* margin whitish at first from the cortina. FLESH whitish. GILLS adnexed, becoming ventricose and sinnuate, *rather broad,* close, pallid then pale ochraceous-cinnamon, edge white-fim-

briate at first. STEM 2-5 cm. long, 3-6 mm. thick, solid or apex hollow, sometimes with a tubule, cortex subcartilaginous, fibrillose or subfloccose, apex floccose-scurfy, often somewhat twisted or curved, pallid but soon darker or tinged umber toward base. CORTINA cobwebby, evanescent, slight remnants at apex of stem or on margin of pileus. SPORES 8-10 x 4-6 micr. (mostly 8-9 x 4-5), elliptical, smooth, pale ochraceous-cinnamon in mass. CYSTIDIA none; *sterile cells* on edge of gills are prominent, *cylindrical.* 40-50 x 4-5 micr. ODOR radishy.

Gregarious or subcaespitose. On denuded or grassy soil in open, pastured woods or similar places, often on sterile, gravelly soil. Washtenaw County. May and June (as early as May 3). Frequent locally.

This Hebeloma loves sterile or gravelly soil which has scanty grass. It is early with us, although Peck reports it for October. In its seasonal habit it corresponds, therefore, with *H. gregarium* from which it differs in size, color, and its smaller spores. Peck says it is closely related to *H. fastibile* but is smaller, with a more slender stem, differently colored pileus and more crowded gills. The margin of the pileus sometimes shows a differentiated brown zone. Small forms are easily confused with *H. hiemale,* except for the spores and the presence of a cortina.

Section II. Denudati. Cortina lacking.

500. Hebeloma sinapizans Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 413.
Plate XCVII of this Report.

PILEUS 6-12 cm. broad, *compact,* convex-expanded, obtuse, *viscid* (moist), glabrous, even, somewhat irregular, *ashy-brown to clay-color* or whitish-tan, sordid. FLESH thick, soft in age. GILLS adnexed to deeply emarginate, *broad,* close, dry, pallid then pale alutaceous-cinnamon, *edge entire and concolor.* STEM stout, 6-12 cm. long, 1.5-2.5 cm. thick, rigid, *equal,* even or striate above, fibrillose, upper part *becoming squarrose-scaly* from the tearing of the cuticle, stuffed but soon cavernous, *white* then dingy, apex squamulose-floccose. SPORES broadly elliptical, hyaline-apiculate at both ends, obscurely rough, 11-13 x 7-8 micr., pale-cinnamon in mass. CYSTIDIA none. ODOR and TASTE usually strongly of radish.

In troops, subcaespitose or gregarious. On the ground, wooded hillsides, oak, maple and beech woods. Washtenaw County. September. Infrequent.

This is one of our largest and most luxurious Hebelomas, appearing after heavy rains. The stout, scaly-torn white stem, lack of cortina, broad gills and large spores, distinguish it. In age and in wet weather it decays rapidly. Fries says it is solitary, but with us it grows in troops as described by Stevenson, often forming dense rows along hillsides where Cortinarii flourish. Cooke's figures illustrate our plant well. It approaches *H. sinuosum* Fr. (sense of Ricken).

501. Hebeloma crustuliniforme Fr.

Epicrisis, 1836.

Illustrations: Michael, Führer f. Pilzfreunde, Vol. II, No. 69.
Engler and Prantl. I, 1**, Fig. 117, p. 242.
Swanton, Fungi, Pl. 40, Fig. 5-6, 1909.
Cooke's Illus., Pl. 507.
Ricken, Blätterpilze, Pl. 32, Fig. 2.
Plate XCVII of this Report.

PILEUS 4-8 cm. broad, broadly convex, then plane, subrepand, slightly viscid (moist), glabrous, even, *pale whitish-tan, disk reddish* or yellowish, *zoneless,* margin at first incurved. FLESH thickish, rather firm, white. GILLS adnexed, *crowded,* narrow, rounded behind, thin, whitish then watery cinnamon-brown, *edge crenulate and beaded with drops* when young or moist. STEM 4-8 cm. long, 4-6 mm. thick, equal or subbulbous, stuffed then hollow, somewhat *floccose-squamulose,* glabrous below, white or whitish, pruinose at apex. SPORES 10-12 x 5-7 micr., apiculate, ovoid elliptical, smooth, pale brown. Sterile cells on edge of gills, cylindric-saccate, 24-30 x 6 micr., abundant. ODOR strong of radish. TASTE disagreeable. Said to be *poisonous.*

Solitary or gregarious, sometimes forming interrupted rings. In frondose grassy woods. Washtenaw County. October. Infrequent.

The description given above is that of the continental mycologists. My own notes and specimens were lost.

Form *minor:* is smaller, pileus 2-3 cm. broad. It has no cystidia on the sides of the gills, and the spores measure 8-10 x 5-7 micr. Sterile cells on the edge of the gills are clavate at the apex. The

edge of the gills exudes drops. Found in the same woods as the type.

Form *sphagnophilum:* These plants grew on dense sphagnum. PILEUS 4-7 cm. broad. STEM 7-9 cm. by 5-8 mm. There are no cystidia on the sides of the gills; the sterile cells on the edge are slender, slightly thickened below, cylindrical above. The edge of the gills distils drops. The odor, when the plants are fresh, is similar to alcohol ethers. Otherwise as the type. See Plate XCVII of this Report.

The most striking characteristic of this species and its varieties is their habit of distilling drops from the gills when fresh or moist. In this respect it imitates *H. fastibile,* but lacks the cortina and has more crowded gills. It is considered poisonous, and is said to be called "poison-pie" in England, no doubt because the color of the cap simulates a baked pie crust. In dry weather it is easily confused with other species, and the occurence of the forms mentioned above shows that it needs further study. It does not seem to be as common here as in Europe.

502. Hebeloma hiemale Bres.

Fungi Tridentini, 1892.

Illustration: Ibid, Pl. 160.

"PILEUS rather fleshy, 2-4.5 cm. broad, convex-subhemispherical then plane and gibbous or depressed, viscid, glabrous, margin at first involute and white flocculose, pale alutaceous, marked by a crustuline center or broad zone. GILLS crowded, white then argillaceous-subcinnamon, edge white-floccose, sinuate-adnate or adnexed and almost free. STEM 2-3 cm. long, 5-7 mm. thick, white, becoming yellowish below, stuffed then somewhat hollow, equal, subfibrillose, apex white-furfuraceous. Spores obversely pyriform, 12-13 x 6-7 micr., golden-yellow under the microscope; basidia clavate, 30-35 x 7-8 micr. ODOR scarcely any. TASTE somewhat bitter.

"Approaching nearest to *H. crustuliniforme,* from which it differs by its constantly smaller stature and scarcely noticeable odor."

The description is that of Bresadola, as my own notes are not full enough. It is with some hesitancy included under Michigan species but is said to occur in the United States and is easily confused with the preceding. It is at least of value to make Bresadola's description accessible in English.

503. Hebeloma longicaudum Fr.

Syst. Mycol., 1821.

Illustrations: Cooke, Ill., Pl. 415.
Gillet, Champignons de France, No. 309.
Berkeley, Outlines, Pl. 9, Fig. 2.
Ricken, Blätterpilze, Pl. 33, Fig. 2.

PILEUS 3-6 cm. broad, convex-expanded, subumbonate, glabrous, viscid (moist), even, somewhat irregular, *pale ochraceous-tan,* becoming whitish. FLESH soft, watery, white. GILLS *arcuate-adnate* then emarginate, medium broad, narrowed behind, crowded, whitish then pale clay-color, edge minutely fimbriate. STEM 5-10 cm. long, 4-9 mm. thick, *white,* equal, subbulbous below, stuffed then somewhat hollow, *fragile,* fibrillose-striate, mealy at apex or throughout. SPORES obliquely-elliptical, inequilateral, narrow at one end, smooth, 12-15 x 6-7 micr. CYSTIDIA none. *Sterile cells* slender, slightly enlarged at base, numerous on edge of gills. ODOR scarcely noticeable or none. TASTE mild, not of radish.

Gregarious. In or near cedar and tamarack swamps, sometimes on sphagnum, sometimes on rich humus. Ann Arbor, New Richmond. September-November. Infrequent.

The white stem, medium size, lack of cortina and large spores distinguish this species. The white-stemmed species of Hebeloma are quite distinct from those with sordid or brownish stems, although the former may become dingy or brownish by handling. The gills are at first adnate-decurrent and often do not become emarginate until late maturity, a character found in several other species. European authors do not agree upon the size of the spores for this species and usually give smaller spores; but our plant agrees so well with descriptions and the figures referred to above that it seems best to place it here. It differs from *H. elatum,* for which Massee gives large spores, by its lack of a radish odor, and the smaller average size of the pileus. Two other related species with persistently white stems were found at New Richmond: (a) had a more slender stem up to 9 cm. long, tapering downward, flocculose at apex, elsewhere innately fibrillose-striate; its pileus was up to 7 cm. broad, yellowish ochre on disk and white on margin; gills rather broad; odor none. (b) was smaller, with a stem about 5 cm. long, hollow and torn-scaly as in *H. sinapizans;* its cap was testaceous-tan and it had a radishy odor. Both forms had spores 9-12 x 5-6 micr. in size. They need further study.

504. Hebeloma albidulum Pk.

N. Y. State Mus. Rep. 54, 1901.

PILEUS 3-6 cm. broad, convex-expanded, obtuse, *glabrous,* viscid (moist), dingy-white, buff, or tinged ochraceous or grayish, even. FLESH white, thick on disk. GILLS adnexed, emarginate, *narrow, crowded,* whitish then isabelline to pale rusty-brownish, minutely white-fimbriate on edge. STEM 3-9 cm. long, 4-10 mm. thick, equal or subbulbous at base, glabrous and innately *silky-shining,* stuffed then hollow, *white,* pruinose at apex. SPORES elliptical, inequilateral, 10-12.5 x 5-7 micr., pale-brownish under the microscope, smooth. CYSTIDIA rather abundant on sides and edge of gills, *cylindrical,* slender, obtuse, about 75 x 5-6 micr. Odor none; taste mild.

(Dried: Pileus rufous-brown to tan; gills rusty-brown; stem pallid to dingy white.)

Gregarious to subcaespitose. On the ground, mixed or frondose woods. Ann Arbor, New Richmond. September-October. Infrequent.

Definitely known by its peculiar cylindrical cystidia; its dingy-white or ochraceous-buff pileus, white stem and narrow gills also help to place it. It is related to *H. album* Pk. which has larger spores, measuring 12-16 x 6-8 micr., and a more persistent white pileus and stem. Both *H. albidulum* and *H. album* can be easily distinguished from *H. sarcophyllum* which is also a pure white species, by the pink gills of the latter. *H. neurophyllum* Atk. may also be confused with it. Some of our specimens had a rather abrupt, oblique and marginate bulb, in this respect approaching Cortinarii, but fresh young specimens lack the cortina. The gills and spores have a peculiar shade of brown, showing their relation to *H. sarcophyllum.*

505. Hebeloma simile sp. nov.

PILEUS 2-6 cm. broad, convex-expanded, whitish tinged ochraceous, subviscid (moist), lustre dull (dry), glabrous, even. FLESH thick on disk, white. GILLS adnate at first, becoming emarginate, *rather broad,* not crowded, ventricose, thin, whitish then alutaceous, edge minutely floccose-denticulate, not costate. STEM 3-8 cm. long, 2-5 mm. thick, *slender,* equal, *not bulbous, white, floccose to mealy throughout,* glabrescent, at length innately fibrillose-striatulate,

stuffed with a persistent pith, white within and without, texture fibrous. SPORES fusiform-elliptical, inequilateral, smooth or obscurely rough, apiculate, 11-13 x 6-7 micr. CYSTIDIA none. *Sterile cells* on edge of gills, *clavate-thickened at apex,* 55-65 micr. long. ODOR and TASTE slightly of radish.

(Dried: Pileus and stem whitish, dingy; gills cinnamon-brown.)

Gregarious. On the ground, in copses, woods, etc., among grass. Ann Arbor, Detroit. September-October. Infrequent.

Differs from *H. neurophyllum* Atk. in the lack of costate gills, the persistent pith of the stem, smaller spores and broader gills. Its *sterile cells* are clavate-thickened like the upper portion of many paraphyses among the Pezizaceae, a character which is said to belong to the sterile cells on the gills of *H. neurophyllum* Atk. It differs from *H. album* Pk. by the broader gills, floccose-mealy stem and smaller spores; and from *H. albidulum* by the lack of cystidia, broader gills, etc.

506. Hebeloma sarcophyllum Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustrations: Ibid, Pl. I, Fig. 7-11.

PILEUS 3-6 cm. (or more) broad, *chalk-white,* becoming dingy white, convex, obtuse, glabrous, subviscid (moist), soon dry, even. FLESH white, thickish. GILLS rather narrow, adnexed, *deeply emarginate,* close, *deep rose to flesh color,* edge minutely fimbriate. STEM 3-8 cm. long, 4-8 mm. thick, equal or tapering upward, clavate-bulbous at first, *white,* firm, stuffed by a persistent pith, finally hollow, fibrillose, glabrescent, minutely scurfy-mealy at apex, subshining. SPORES ventricose-elliptical, subinequilateral, ovate-pointed at both ends, obscurely rough, at first *deep-flesh color in mass,* but changing to dark brown, 9-12 x 5-6 micr. STERILE CELLS on edge of gills, cylindrical, slender, 5-6 micr. diam. CYSTIDIA similar, rarely found. ODOR subfarinaceous, TASTE bitterish.

Solitary, scattered or gregarious. On grassy ground, in frondose or mixed woods. Ann Arbor, Huron Mountains. June-August. Infrequent.

Remarkable for the deep pinkish color of the mature gills and spores which simulate those of a Psalliota. There is no cortina, else the shape and structure of the spores would indicate a Cor-

tinarius. The spores lose their pink color in the herbarium. Luxuriant specimens, with caps 15 cm. across, have been found, whose surface was minutely silky-floccose. When fresh the plants present a beautiful appearance because of their chalky whiteness of cap and stem as contrasted with the deep flesh-colored gills. It is an aberrant species and approaches the genus Entoloma.

507. Hebeloma album Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustrations: Ibid, Pl. G, Fig. 1-7.
N. Y. State Mus. Bull. 139, Pl. 117, Fig. 1-6, 1910.

"PILEUS 2.5-5 cm. broad, fleshy, firm, convex becoming nearly plane, or concave by the margin curving upward, glabrous, subviscid, *white or yellowish-white.* FLESH white. GILLS thin, *narrow,* close, sinuate, adnexed, whitish *becoming brownish-ferruginous.* STEM 3.5-7 cm. broad, 4-6 mm. thick, equal, firm, rather long, *solid or stuffed,* slightly mealy at the top, *white.* SPORES subellipsoid, pointed at both ends, 12-16 x 6-8 micr."

Specimens sent from Detroit have been referred by Peck to this species. Its large spores, narrow gills and white or almost white cap distinguish it from related species. Compare *H. albidulum, H. simile* and *H. sarcophyllum.*

508. Hebeloma colvini Pk.

N. Y. State Mus. Rep. 28, 1876.

"PILEUS 2-7.5 cm. broad, convex or nearly plane, sometimes gibbous or broadly umbonate, rarely centrally depressed, glabrous, grayish or alutaceous with an ochraceous tint. GILLS close, broad, sinuate, adnexed, whitish, becoming brownish-ochraceous. STEM 2-8 cm. long, 2-6 mm. thick, equal, flexuous, silky-fibrillose, stuffed or hollow above, solid toward the base, whitish. SPORES ellipsoid, 10-12 x 5-6 micr. Sandy soil in open places. The mycelium binds the sand into a globose mass which adheres to the base of the stem."

The description is that of Peck. One collection at New Richmond is closely related. The plants grew in sand which adhered to the cap and stem. Our plants varied from the type in having narrow gills and a solid stem which becomes cavernous.

509. Hebeloma syrjense Karst.

PILEUS 2-5.5 cm. broad, convex-expanded, firm, glabrous, *viscid,* provided with a gelatinous, separable pellicle, even, *rufous or brick-red,* fading to ochraceous-brown, margin at first incurved. FLESH toughish, pallid or tinged rufous-brown. GILLS adnate at first, then emarginate, close, moderately broad, whitish then rufous-brown to cinnamon-brown, edge obscurely flocculose. STEM 4-6 cm. long, 3-5 mm. thick, subequal or attenuated downward, *floccose-scaly above,* glabrescent below, *toughish,* elastic, stuffed then hollow, whitish, becoming sordid brownish below, even. SPORES elliptical, inequilateral, apiculate, smooth, 8-10.5 x 5-6 micr., pale rusty-cinnamon in mass. CYSTIDIA none. *Sterile cells* short, slender, cylindrical, on edge of gills. ODOR slight. TASTE slightly astringent.

Gregarious or caespitose. On the ground in frondose woods. Ann Arbor. September-October. Infrequent.

This species has the appearance of a Cortinarius, but no cortina is present in the young stage; on this account it is also to be distinguished from *H. testaceum.* The brick-red color, caespitose stems and separable pellicle are characteristic features. The somewhat tough texture is also a marked character. When young, the pileus is often bay-brown and in age may become irregular or repand.

510. Hebeloma magnimamma Fr.

Hymen. Europaei, 1874.

Illustration: Cooke, Ill., Pl. 508.

PILEUS 1-2 cm. broad, *umbonate,* convex, *brick-red* (moist), paler on margin, fading, glabrous, viscid (moist), even. GILLS adnate, close, thin, narrow, width uniform, ochraceous-isabelline, edge white-fimbriate. STEM 3-4 cm. long, 1-2 mm. thick, equal, even, *glabrous,* narrowly fistulose, pallid-ochraceous, apex pruinose. SPORES elliptical, smooth, mostly with a large nucleus, 7-9 x 4-5 micr. *Sterile cells* on edge of gills numerous, narrow-cylindrical, about 65 x 4-5 micr.

Gregarious. Ground in cedar swamp. New Richmond. September. Rare.

Flammula Fr.

(From the Latin, *flamma,* a flame.)

Ochre-brown to rusty-spored. Stem central, continuous with the pileus, without an annulus, *fleshy or fibrous;* partial veil in the form of a fibrillose or subarachnoid cortina, evanescent. Gills *adnate or subdecurrent at first.* Spores *dark brown, rusty-brown or rusty-yellow.* Pileus viscid or dry. Mostly *on wood.*

Fleshy, putrescent, lignicolous, rarely terrestrial fungi, characterized by the habitat and the spore-color. To be separated from Pholiota by the non-membranous inner veil; from Hebeloma by the darker brown or rusty-yellow gills and spores; from Naucoria by the fleshy-fibrous stem; from Continarius by the habitat on wood. It corresponds to Hypholoma of the purple-spored group in habit. By reason of the bitter taste or odor, the Flammulas are not attractive for food, and although no definite information is available to prove that they are not edible, they are usually considered unpalatable and looked upon with suspicion. The genus is difficult and the species appear to run into one another. They occur mostly in the northern forests.

The PILEUS is often very viscid, with a separable pellicle, or, in the section Sapineae, with a dry adnate cuticle; it is usually tinged with yellowish, olivaceous or fuscous hues. The margin or surface is sometimes dotted with thin, fibrillose scales but becomes denuded in age or after rains; it is therefore important to obtain fresh plants for study. The fibrillose *cortina* is more copious in some species than in others and this fact must be kept in mind. The GILLS are referred to by authors as adnate-decurrent and some emphasize the decurrent character as a means of recognizing the genus; there is, however, considerable variation in this respect, and more often the gills are adnate or slightly rounded behind and in age may become emarginate as in related genera. The color of the gills at maturity is conditioned by the spores and is markedly different in the first and last section. *F. polychroa* is unique by the gray and purplish hues which cloud them. *F. carbonaria* has dark dirty-brown gills. In the last section they are bright rusty-ochre or yellow. The STEM is fleshy or fibrous, usually more or less fibrillose, glabrescent, mostly naked at the apex and with a tendency to become darker, sordid, brown or rusty in age, especially at or toward the base. The SPORES are usually elliptical or oval, smooth or slightly rough under high magnification. A spore-print is very

important for the diagnosis of species, because of the considerable difference in the color. CYSTIDIA are present and rather abundant on the sides and edge of the gills. The ODOR is an important character and was frequently employed by Fries, especially in the Monographia, to separate the species. The TASTE is often bitter, sometimes strong, and tends to turn away the searcher who is after edible mushrooms.

The species are not yet well understood, especially in this country. Peck has described some twenty-five species but most of these are poorly known. Only about half of my different collections have been included here since the rest are still doubtfully determined. Few species seem to be common at least in the southern part of the State but it is likely that more species occur in the north during favorable seasons.

Key to the Species

(A) Pileus dry, golden-tawny, minutely floccose-scaly; gills chrome-yellow. 519. *F. sapinea* Fr.
(AA) Pileus glutinous, viscid, subviscid or moist.
(a) Gills grayish to olive-purplish-fuscous; pileus glutinous, with superficial scales. 511. *F. polychroa* Berk.
(aa) Gills without gray or purple tints.
(b) Pileus 6-12 cm. or more broad, viscid, flesh white. 512. *F. lubrica* Fr.
(bb) Pileus 3-8 cm. broad, glutinous; flesh white. 513. *F. lenta* Fr.
(bbb) Pileus 2-7 cm. broad; flesh yellowish.
(c) Gills smoky-brown to fuscous-brown; pileus not truly yellow. 514. *F. carbonaria* Fr. var.
(cc) Gills yellow or pallid-ochraceous.
(d) Pileus with viscid or glutinous separable pellicle.
(e) Pileus sulphur-yellow, with fulvous center; stem slender; flesh thin. 515. *F. spumosa* Fr.
(ee) Pileus pale ochraceous-olivaceous-buff; flesh thick. 517. *F. gummosa* Fr.
(dd) Pileus without a viscid pellicle.
(e) Odor strong, bitter; pileus pale, cadmium-yellow, lubricous; stem elongated. 518. *F. alnicola* Fr.
(ee) Odor slight or none; pileus bright yellow, glabrous, margin cortinate. 516. *F. flavida* Fr.

Section I. Phacotae. Spore mass sordid brown. Pileus with a more or less viscid or glutinous, separable pellicle.

511. Flammula polychroa Berk.

Lea's Catalog, Plants, Cinn. 1844.

Illustrations: Atkinson, Mushrooms, Fig. 147, p. 156, 1900.
Moffatt, Chicago, Nat. Hist. Surv., Bull. No. VII, Part I, Pl. 10, Figs. 1-2, 1909.

PILEUS 3-7 cm. broad, broadly convex, then expanded, obtusely depressed, sometimes broadly umbonate, very viscid, *varying dull orange to yellowish on disk, paler yellowish toward the olive or greenish margin,* in age variegated yellowish-olivaceous-brown, at first *decorated toward margin by wedge-shaped, creamy to vinaceous, fibrillose, detersile, delicate scales,* concentrically arranged, the outermost forming an interrupted fringe at the edge of the pileus, glabrescent in age, margin even, at first incurved. FLESH soft, moist, thick on disk, thin on margin, yellowish-white. GILLS adnate, rounded behind or sinuate, often seceding or subdecurrent in age, rather broad behind, tapering anteriorly, close to crowded, at the very first creamy-buff, soon grayish-fuscous, *finally dark olive purplish-gray,* edge white-flocculose. STEM 3-6 cm. long, 3-5 mm. thick, *slender,* rigid-tough, subequal, curved, solid-fibrous within, in age hollow, fibrillose and *dotted with small, recurved scales up to the evanescent annulus,* yellowish above, becoming dull reddish-brown below. VEIL rather well-developed at the first, varying white to vinaceous, lilac or purplish-tinged, floccose-fibrillose. SPORES oval or short oblong, 6-7.5 x 3.5-4.5 micr., smooth, dark, fuscous-brown *with a slight purplish tinge in mass.* CYSTIDIA numerous on sides and edge of gills, subventricose below, lanceolate above, about 55 micr. long.

Solitary to subcaespitose. On logs, sticks, dead branches, etc., frondose and mixed coniferous woods.

Marquette, New Richmond, Ann Arbor, etc. Throughout the State. July-October. Rather frequent.

This species is distinguished from all the other Flammulas by the peculiar color of the gills and spores; the tint of gray and purple which these possess may easily lead the student into placing it among the purple-spored genera. The other characters, however, ally it to the genus Flammula. The colors of the pileus are, furthermore, quite variable, but there is nearly always an olivaceous tint present, especially on the margin when young. The pelliculose cap is usually glutinous and when fresh dotted with the triangular, hairy, appressed scales. It is apparently indigenous to America.

512. Flammula lubrica Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 116, Fig. 1.
Ricken, Blätterpilze, Pl. 57, Fig. 4.

PILEUS 6-12 cm. broad, tough, broadly convex, then expanded, obtuse or depressed, *tawny-orange or fulvous on disk,* yellowish on margin, sometimes paler, with a separable, *viscid* pellicle, loosely *scaly-dotted,* glabrescent, even. FLESH whitish, moist, rather thick, tinged yellow under pellicle. GILLS adnate, then emarginate or seceding, sometimes subdecurrent or uncinate, medium broad, close to crowded, sulphur-yellow to greenish-yellow, *then dingy-ochre to olive-brown,* edge minutely fimbriate. STEM 4-6 cm. long, 8-15 mm. thick, equal or slightly tapering downwards, curved or straight, subbulbous at base, spongy-solid or hollowed by grubs, at first *whitish within and without,* tinged yellowish or at base rusty-brown in age, fibrillose. SPORES minute, elliptical, 5-6 x 3-3.5 micr., smooth, pale rusty-brown in mass. CYSTIDIA very abundant on sides and edge of gills, ventricose, obtuse, 45 x 12-15 micr., rarely longer. ODOR and TASTE mild or very slightly of radish.

Gregarious or subcaespitose. On decaying logs in mixed or frondose, low woods. Bay View, New Richmond. September. Infrequent or local.

Our plant departs slightly from the accepted characters for the species. It is known by its large size, viscid or glutinous, scaly-dotted, yellow-tawny cap and whitish stem when fresh. The colors of the pileus are shown in the figures of Fries, although a form, such as is shown in Ricken's figure, has been found in the same locality with the Friesian plant. The flesh of both forms is white in the fresh plant. The color of the spore-mass indicates the next section; but it must not be confused with *F. spumosa* which is a smaller plant, whose cap is not dotted with scales, and whose flesh is greenish-yellow. *F. lubrica* appears to be limited to the coniferous regions of the State.

513. Flammula lenta Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 439 and 440.
Gillet, Champignons de France, No. 284.
Ricken, Blätterpilze, Pl. 57, Fig. 3.

PILEUS 3-7 cm. broad, firm, convex-expanded, obtuse, *glutinous,* dotted toward margin with scattered, concentric, superficial, fibrillose scales, or glabrous and white-silky on the incurved margin, *dingy white to buff,* brownish-tan on disk, even. FLESH pallid, slightly thick. GILLS adnate-subdecurrent, rather narrow, close, white at first then pale alutaceous, buff-color, edge minutely white-flocculose. STEM 4-7 cm. long, 8-11 mm. thick, varying equal, tapering down or subbulbous, stuffed then narrowly tubular, firm, floccose-pruinose at apex, floccose-scaly up to the obsolete annulus, white, becoming brownish toward base in age. SPORES elliptical, slightly curved, smooth, pale, 5-7 x 3.5-4 micr., grayish-brown in mass. CYSTIDIA abundant on sides and edge of gills, lanceolate, ventricose, obtuse at apex, 50-55 x 12 micr., deep in the subhymenium. ODOR and TASTE slight.

On decaying logs or on the ground among debris in conifer woods. New Richmond. September. Infrequent.

Known by its pale color, glutinous cap and the remnants of the whitish cortina on the margin of the cap or on the stem. It differs from *F. lubrica* mainly in color, especially in the color of the gills. It is seldom reported in this country, although very abundant in Europe. The flesh is white. *Hebeloma glutinosum* also has a glutinous, scaly-dotted pileus, but the gills are said to be emarginate, and the flesh of the stem to become blackish toward the base. (Ricken, Blätterpilze.) In drier weather the pileus is less viscid and may appear to be entirely naked. It is easily mistaken for a Hebeloma because of its pale gills and its frequent development on the ground. *Hebeloma parvifructum* Pk. may be a form of this species, although Peck does not report any cystidia.

514. Flammula carbonaria Fr. var.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 442.

PILEUS 2-6 cm. broad, pliant, convex, *then plane,* usually depressed in age, more or less viscid or subviscid, pellicle somewhat separable, dull crustuline to fulvous-yellowish, *dull dingy-rufous-brown in age,* disk rusty-yellow, glabrous, even, at first with remnants of cortina on edge. FLESH pallid then tinged yellowish, rather thin. GILLS adnate-subdecurrent, sinuate in age, crowded, rather narrow, at first pallid, *finally pale smoky-brown or fuscous-brown,* edge white-fimbriate. STEM 3-5 cm. long, 3-5 mm. thick at apex, *tapering downwards,* tough, rigid-elastic, flexible, dilated and cavernous at apex, elsewhere soon *hollowed in form of tubule,* fibrillose, at length *dark sordid-brown or smoky-fuscous,* curved or bulbillose at attached base. SPORES elliptic-oblong, smooth, 6-7.5 x 3.5-4 micr., pale ochraceous under microscope, *solid fuscous-brown in mass.* CYSTIDIA on sides and edge of gills, scattered, flask-shaped to subcylindrical, variable, 30-55 x 10-15 micr. ODOR and TASTE slight or mild.

Solitary, gregarious or caespitose, on roots, sticks, stumps, etc., in low, swampy woods or wet places. New Richmond, Ann Arbor. September-October. Infrequent.

At least two forms have been referred here: a small plant, with cap 2-3 cm. broad, growing on burnt-over ground, and a larger plant not always on charcoal remains, to which I have referred my collections. Cooke's figures illustrate our plants well except in the slightly smaller size. The principal characteristic is the color of gills and spores, in which it approaches *F. fuscus.* No critical notes of such a plant other than the description of *F. carbonarius* are at hand, and authors vary considerably in their conception of it except that they hold closely to the idea that it occurs always on charred soil or wood. Hard illustrates what appears to be the small form, and Ricken likewise emphasizes the small size in which respect they follow the Friesian tradition. Under this name Peck has described a still different form, whose spores measure 7-10 x 4-5 micr., and which also grows on charcoal beds. The species clearly needs further study in this country, as it is not likely that either Peck's or my plants represent the Friesian species. *F. highlandensis* Pk. may represent the true species.

Section II. Caespitose, spores rusty-brown in mass. Caespitose or crowded. Pileus with subviscid, subseparable pellicle.

515. Flammula spumosa Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 116, Fig. 3.
Cooke, Ill., Pl. 475.
Ricken, Blätterpilze, Pl. 57, Fig. 5.

PILEUS 2-5 cm. broad, convex-plane, with viscid, separable pellicle, *sulphur-yellow,* sometimes greenish-tinged, fulvous on *center,* paler on margin, glabrous, even, sometimes obscurely virgate, provided when young with a yellowish-white cortina on the margin. FLESH *yellowish or greenish-yellowish,* rather thin. GILLS adnate-emarginate or decurrent by a tooth, close, moderately broad, *sulphur-yellow or greenish-yellow at first,* finally pale ferruginous. STEM 3-7 cm. long, 3-7 mm. thick, *often slender,* equal, hollow by a narrow tubule which is at first stuffed, *fibrillose,* yellowish above, soon sordid rusty-fulvous toward base. SPORES elliptic-oval, smooth, 6-8 x 4-5 micr., contracted toward one end. CYSTIDIA on sides and edge of gills, 60-70 x 12 micr., lanceolate-ventricose. ODOR slight or of radish.

Gregarious or scattered. On the ground among forest debris or on mossy logs, etc., in coniferous regions in moist places. Marquette, Houghton, Bay View, New Richmond, Detroit. July-September. Rather frequent.

This is probably as common as any of the Flammulas but is to be sought in the regions once covered with hemlock or pine. The color of the pileus and flesh varies from youth to age, becoming darker or more dingy, and individual specimens vary from sulphur-yellow to greenish-yellow but are never as green on the margin of the cap as *F. polychroa.* The usual distinguishing marks are the sulphur-yellow margin of the cap, its fulvous to tawny disk, the marked viscidity, the slender, fibrillose stem and the yellowish or citron-yellow flesh. The spores have a rather characteristic shape as compared with nearly related species.

516. Flammula flavida Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 444.
Ricken, Blätterpilze, Pl. 58, Fig. 1.

"PILEUS 4-7 cm. broad, campanulate-expanded, subumbonate, moist, *not viscid,* even, *glabrous,* rather regular, *bright yellow* (flavus), sometimes almost sulphur-yellow with pale fulvous disk, decorated *along the margin by the adherent, white or pallid remains of the cortina.* FLESH white then yellowish. GILLS adnate, close, thin, rather narrow, at first white, soon yellowish *then rusty-fulvous,* edge white-fimbriate. STEM 5-10 cm. long, 6-10 mm. thick, either narrowed or enlarged toward base, stuffed then hollow, fibrillose, flavus-yellow, rusty toward base, at length entirely rusty-brown, *sometimes with evanescent annulus.* CORTINA whitish. SPORES elliptical, 8-9 x 4-5 micr., smooth, ferruginous. CYSTIDIA clavate, 36-40 x 8-9 micr."

Reported by Lonygear from Chandlers, Michigan. The description is adopted from the Monographia of Fries, with additions from Ricken. It seems to be well-marked by the non-viscid pileus, the shreds of the cortina on its margin or on the apex of stem and the spores.

517. Flammula gummosa Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 441.
Fries, Icones, Pl. 116, Fig. 2.
Ricken, Blätterpilze, Pl. 57, Fig. 1.

PILEUS 3-7 cm. broad, convex-plane, at length subdepressed or subumbonate, with a *glutinous,* separable pellicle, even, *pale ochraceous mixed with buff and olivaceous hues,* glabrescent. FLESH thick on disk, concolor when moist, paler when dry. GILLS adnate-subdecurrent, broad behind, tapering in front, close, *pale ochraceous-cinnamon,* edge minutely flocculose. STEM 4-6 cm. long, 4-10 mm. thick, rather firm, subequal, *floccose-scaly above,* fibrillose below, stuffed, *pallid above,* umber downwards, dull reddish-umber when bruised at base. SPORES oblong-elliptical, 6-7 x 3-4 micr., smooth, pale rusty-brown. CYSTIDIA scattered, ventricose, tapering, 45-50 x 15 micr. ODOR and TASTE mild.

Solitary or subcaespitose and crowded. At the base of stumps in mixed woods. New Richmond. September. Rare.

Our specimens are well illustrated by Cooke's figures. The species differs from *F. lubrica* in its usually glabrous pileus and the rusty-red base of stem; the spores are slightly smaller.

518. Flammula alnicola Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 443.
Gillet, Champignons de France, No. 282.
Grevillea, Vol. VI, Pl. 90.
Ricken, Blätterpilze, Pl. 58, Fig. 5.

"PILEUS 5-7 cm. broad, convex then expanded, obtuse, *not truly viscid,* lubricous, at first superficially fibrillose toward margin, sometimes minutely scaly, *cadmium-yellow,* becoming rusty and sometimes greenish. FLESH slightly compact, concolor. GILLS subadnate, at times decurrent or rounded behind, broad, plane, *at first dingy-pallid* or yellowish-pallid, at length ferruginous. STEM 5-10 cm. long, 6-12 mm. thick, attenuated-rooting at base, commonly curved or flexuous, *fibrillose,* at first cadmium yellow then becoming rusty. CORTINA manifest, fibrillose or arachnoid. SPORES elliptical, 9 x 4 micr. ODOR *strong and pungent, bitter.* TASTE *bitter.*

"On old stumps of frondose trees especially of alder and willow."

This has been reported from the State, but I have found no typical specimens. Ricken describes and figures a plant with smaller spores, which departs considerably from the figures of Cooke, Gillet and those in Grevillea. The description given above is adopted from that of Fries in Monographia, and the figures of Cooke, etc., fit it well. *F. alnicola* should be recognized by its long, rooting, caespitose stems, by the color and by the strong bitter odor. Peck reports it from the Catskill and Adirondack Mountains only.

Section III. Sapineae. Spore mass ochre-yellow. Gills fulvous-golden yellow. Pileus dry or nearly so.

519. Flammula sapinea Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 118, Fig. 3.
Cooke, Ill., Pl. 447.
Michael, Führer f. Pilzfreunde, Vol. III, No. 90.
Moffatt, Chicago Nat. His. Surv., Bull. 7, Part I, Pl. 9, Fig. 2.

PILEUS 2-7 cm. broad, *firm,* convex, then subexpanded, obtuse, golden-yellow to tawny, paler toward margin, velvety or *minutely floccose-scaly, dry,* at length fading and rimose-cracked. FLESH thick, *yellowish.* GILLS adnate, plane, rather narrow, thin, *chrome-yellow* then rusty-yellow, edge minutely fimbriate. STEM 4-7 cm. long, 6-12 mm. thick, rather stout, stuffed then hollow, *sometimes compressed and irregular,* fibrous, innately fibrillose, yellowish, brownish below when handled. CORTINA yellowish, scanty. SPORES elliptical, 6-8 x 4-5 micr., smooth, rusty-yellow. ODOR strong.

Subcaespitose, scattered or solitary. On wood of conifers in the north; on tamarack stumps and logs in the southern part of the State. Bay View, New Richmond, Ann Arbor, Detroit. August-October. Infrequent.

This is a rather variable plant, not yet sufficiently studied. The forms on tamarack are apparently the same as the species in pine and hemlock woods but often the pileus is almost glabrous. In the young state the colors are rich, in age they often fade.

Galera Fr.

(From the Latin, *Galera, a little helmet.*)

Ochre-brown or rusty-yellow spored. Stem *subcartilaginous,* tubular, slender. Partial veil none or fibrillose; volva lacking. Pileus thin, conical, campanulate or oval, *its margin at first straight and appressed on the stem.* Spores elliptical or oval, usually smooth. Cystidia lacking.

Putrescent, fragile, small mushrooms, growing on dung, mosses, grass or on the ground. They correspond to Mycena of the white-

spored group in the nature of the stem, the straight margin of the young pileus and in the slender habit; they also correspond to Nolanea of the pink-spored group. Their small size, growth on dung and scarcity in number makes them useless for food.

The PILEUS is thin and membranous, either conical, oval or elliptical when very young, becoming campanulate, or, in a few species, expanded. It is hygrophanous and in many species is striatulate on the margin when moist. The color varies within narnow limits, mostly rusty, ochraceous, brownish, yellowish or whitish; when dry they usually fade to a much paler shade. Many develop an atomate or delicate silky surface after losing their moisture, such "atoms" being due to microscopic erect cells.

The GILLS are never decurrent, but are either narrowly adnate or adnexed to the stem within the cone of the pileus. They are more generally narrow and linear, although some species possess ventricose, rather broad gills. *Galera ovalis,* described in European works, has very broad gills, and seems to be a rarity with us, if it is not entirely lacking. It has been reported from the United States but may have been confused with others. Ricken omits it from the list of German Galeras. The mature gills of this genus are usually a pale rusty-yellow which is a convenient mark of recognition; sometimes this color shades into cinnamon. The edge of the gills is provided with microscopic sterile cells. In the first section they have the shape of nine-pins or Indian clubs, with a rounded knob at the apex, i. e., capitate, but with a more narrowed base. These can scarcely be seen, unless a portion of a gill is mounted sideways under the microscope. In the other groups, these cells vary in shape from lanceolate to filiform, and are never capitate. True cystidia are wanting. The *trama* of the gills is usually composed of large-celled hyphae, and a careful comparative study may bring out good specific characters here. The STEM is always slender, hollow, and usually fragile. In some species, however, it is toughish or flaccid as in certain Mycenas. In texture it is somewhat cartilaginous. It is usually equal throughout but species are known where a marked thickening occurs at the base in the form of a bulb; others may develop a slight bulblet or even a long root-like prolongation as in *G. antipus.* The CORTINA is lacking in most or all of the section Conocephalae. In the second group there is a delicate, fibrillose cortina which disappears early. Another section, of which no examples are included below, includes species which have a more highly developed superficial veil whose delicate remnants are visible after the pileus has expanded. Some of

these, e. g., *G. pellucida* Fr., *G. stagnina* Fr. and *G. paludosa* Fr., are now placed in the genus Tubaria, because of their decurrent or broadly adnate gills. *G. rufipes* Pk. seems at present the only species of this third section likely to be found within our limits.

About 24 species of Galera have been reported or newly described for the United States east of the Rocky Mountains. Some of these will probably be found to be synonyms. Several unnamed species are included below whose identity is not established and which as yet seem to be distinct from the others. This genus needs considerably more microscopic study in order to place its species on a firm basis. Special pains were taken to obtain material throughout the course of this study but a comparatively small number of the described American species came to hand. See Plate XCVII for habit.

Key to the Species

(A) Edge of gills provided with microscopic, capitate, sterile cells. (Growing on dung, or on the soil among grass of manured lawns, gardens, fields and pastures.)
  (a) Stem long, rooting below the enlarged base; primarily on dung-hills. 520. *G. antipus* Lasch.
  (aa) Stem without root-like prolongation.
    (b) Stem bulbous-enlarged at base; gills narrow; on dung-hills. 522. *G. bulbifera* sp. nov.
    (bb) Stem equal.
      (c) Gills very broad, almost free, ferruginous; plants large, very fragile; rare. *G. ovalis* Fr.
      (cc) Gills narrow to medium broad.
        (d) Stem striatulate and pubescent; spores 10-12 x 6-7 micr. 523. *G. pubescens* Gill.
        (dd) Stem not markedly striatulate.
          (e) Spores small, 7-8.5 x 4-5 micr., pileus soft and very fragile, finally expanded. 527. *G. teneroides* Pk.
          (ee) Spores 10 micr. or more in length.
            (f) Pileus markedly cylindric-conical, longer than wide, pale isabelline. 521. *G. lateritia* Fr.
            (ff) Pileus not narrowed-conical.
              (g) On cow-dung; spores 15-18 x 9-10 micr; pileus not striatulate when moist. 524. *G.* sp.
              (gg) In grassy places, lawns, etc.
                (h) Stem tough, filiform; spores 9-12 x 6-7 micr. 528. *G. capillaripes* Pk.
                (hh) Stem fragile.
                  (i) Gills crisped and interveined. 526. *G. crispa* Longyear.
                  (ii) Gills not crisped; very common on lawns. 525. *G. tenera* Fr.

(AA) Edge of gills with sterile cells of a different form. (Growing attached to mosses, grass, sedges, etc., in moist places.)
  (a) Stem bluish to greenish-gray; on mosses in swamps. 529. *G. cyanopes* sp. nov.
  (aa) Stem whitish or pallid.
    (b) Pileus sulcate, convex; gills narrow; on grass. 530. *G. plicatella* Pk.
    (bb) Pileus even or striatulate when moist; gills broad.

(c) Spores 8-10 x 5-6 micr., pileus conic-campanulate; very common on mosses; small. 531. *G. hypnorum* Fr.
(cc) Spores 10-12 x 6 micr., pileus hemispherical-convex; on grass. *G.* sp.

Section I. Conocephalae. Pileus conico-campanulate at first; gills ascending and on the edge with microscopic differentiated, capitate cells; cortina none. Habitat on dung or manured ground.

520. Galera antipus Lasch.

Illustrations: Fries, Icones, Pl. 128, Fig. 2.
Gillet, Champignons de France, No. 293.
Ricken, Die Blätterpilze, Pl. 60, Fig. 9.

PILEUS 1.5-2.5 cm. broad (rarely up to 5 cm.), *broadly campanulate,* dingy ferruginous-cinnamon (moist), hygrophanous, yellowish-isabelline (dry), glabrous or subpruinose, not striatulate, atomate when dry, subflaccid. FLESH submembranous, slightly fleshy on disk. GILLS narrowly adnate, ascending, *crowded, narrow,* sublinear, pale cinnamon-ochraceous, finally dark ferruginous. STEM 3-5 cm. long and 2-4 mm. thick above substratum, *subfusiform-enlarged at base, and with a very long, subhorizontal, thickish, flexuous, whitish root-like prolongation,* pruinose or scurfy, *striate or twisted,* concolor or paler than pileus. SPORES lemon-shaped, obscurely 6-angled, otherwise smooth, 8-9 x 6 micr. BASIDIA 18-25 x 7-8 micr.; *sterile cells* on edge of gills, small, capitate. ODOR none.

Gregarious on dung-hills in beech and pine woods. New Richmond. September. Locally abundant.

This is often a large-capped species, known by its long root-like prolongation, which may extend 5-8 cm. below the point of entrance. Dung-hills on which the plants are plentiful, are often penetrated by a thick mass of these "roots" which interweave in a horizontal position. The stem appears clavate or fusiform where it enters the substratum, and easily separates at this point, so that the "root" is easily overlooked. All stages of development were observed; the very young pileus is oval and whitish, and is scarcely broader than the stout young stem; it becomes campanulate and finally is broadly expanded. No cortina is present at any stage. The spores are very characteristic and agree entirely with Ricken's description. Cooke gives the spores entirely too large in connection with Plate 463 of the Illustrations.

521. Galera lateritia Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 127.
Michael, Führer f. Pilzfreunde, Vol. III, No. 94.
Ricken, Die Blätterpilze, Plate 60, Fig. 11.
Cooke, Ill., Plate 460.

PILEUS 2.5-3 cm. high, 2-2.5 cm. wide, almost *cylindrical-conical,* later subcampanulate, *pale isabelline,* hygrophanous, glabrous, finely striate on margin. FLESH membranous. GILLS nearly free, *narrow,* linear, ascending, crowded, fulvous-rusty-ochraceous. STEM 5-10 cm. long, 2-3 mm. thick, rigid, equal, hollow, *fragile, pure white,* mealy-frosted. SPORES elliptical, ferruginous, 12-15 x 8-9 micr., smooth. STERILE CELLS on edge of gills capitate.

On dung or rich grassy places. Reported by Longyear as abundant; rarely seen by the writer. June-September.

The color of the cap is not as dark as in some of the Friesian figures; a fact noted by European as well as American observers. The narrow, elongated pileus is unique among the Galeras.

522. Galera bulbifera sp. nov.

PILEUS .5-2.5 cm. broad, oval-campanulate, obtuse, *ferruginous-cinnamon* when moist, hygrophanous, ochraceous and atomate when dry, rivulose-reticulate. GILLS ascending-adnate, *narrow, sublinear,* close to crowded, ferruginous-cinnamon, sprinkled by ferruginous spores. STEM 6-15 cm. long, 1.5-3 mm. thick, strict when moist, equal above the bulbous base, pale ferruginous, hollow, glabrous-shining when dry, sometimes faintly striatulate. SPORES elliptical, obtuse at ends, smooth, ferruginous in mass, 12-15 x 8-9 micr. CYSTIDIA none. STERILE CELLS on edge of gills small, capitate. ODOR none.

On horse dung; dung-hills in mixed woods. New Richmond. September.

Variable in size; solitary specimens attain the large size, while a patch of them is apt to be composed of smaller sizes. It has the appearance, in the large condition, of *G. ovalis,* but differs by the narrow gills, etc. It is well marked by the gills, the bulblet at base of stem, and the spores. The whole plant is ferruginous-cinnamon when moist, and in large plants the pileus is finely rugose-reticulate.

523. Galera pubescens Gill.

Champignons de France, 1874.

Illustrations: Ibid, No. 296.

PILEUS 1-4 cm. broad, *oval-campanulate* or obtusely conical-campanulate, *ferruginous-cinnamon* to rufous-brown when moist, hygrophanous, buff to ochraceous-tan when dry, sometimes reticulate-rivulose or obscurely rugulose, atomate when dry. FLESH submembranous. GILLS ascending-adnate, *rather narrow, close,* subventricose, cinnamon-ochraceous. STEM 3-10 cm. long, 1-3 mm. thick, *equal,* often *striatulate, minutely pubescent or glabrous,* hollow, brownish-ochraceous, becoming pallid and shining. SPORES elliptical, smooth, obtuse, 10-12 x 5.5-7 micr. CYSTIDIA none. STERILE CELLS capitate, on edge of gills.

Common locally on cow-dung, cultivated fields, etc. Ann Arbor, New Richmond. June-September.

This differs from *G. bulbifera* in the size of the spores and of the stem which is of equal size to the base. The stem is usually pubescent as is also the surface of the pileus; but not too much stress must be laid on this character since it is not unusual for other species of Galera to develop pubescence on cap and stem when growing on dung in shaded, moist situations. The stem also varies considerably as to the striations; these are normally well-marked but may be entirely lacking.

524. Galera sp.

Plate XCVII of this Report.

PILEUS 12-16 mm. broad, campanulate, *not striatulate,* watery-cinnamon-brown when moist, hygrophanous, pale whitish-ochraceous and atomate when dry; FLESH submembranous, concolor. GILLS adnate-seceding, ascending, *rather broad, ventricose,* close to subdistant, ferruginous at maturity. STEM about 5 cm. long, 1-1.5 mm. thick, *equal,* not bulbillate, fibrous-rigid, hollow, even, glabrous or pruinate, white at first, then pallid or pale ochraceous. SPORES large, broadly elliptical, obtuse, smooth, ferruginous in mass, 15-18 x 9-10 micr. CYSTIDIA none. STERILE CELLS on edge of gills, capitate.

On cow-dung in pine woods. New Richmond. September.

Differing from the preceding two, in the large spores, broad and

ventricose gills and paler colors. It was distinguished only once and no name is as yet applied to it. It is included merely for comparison. It may prove to be a form of *G. pygmaea-affinis* Fr.

525. Galera tenera Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 461.
Hard, Mushrooms, Fig. 223, p. 276, 1908.
Murrill, Mycologia, Vol. 3, Pl. 40, Fig. 6.

PILEUS 8-16 mm. broad, *obtusely conic-campanulate,* hygrophanous, pale ferruginous and striatulate when moist, *whitish to creamy-white and even when dry,* glabrous, atomate when dry; FLESH submembranous. GILLS ascending-adnate, close to subdistant, rather narrow, uniform in width, cinnamon when mature. STEM 3-7 cm. long, 1-1.5 mm. thick, equal or subequal, straight, slender, *fragile,* subshining, hollow, concolor (moist and dry), pruinose at apex, even or faintly striatulate. SPORES variable in size, 11-16 x 6-9 micr., elliptical, smooth, obtuse. CYSTIDIA none. STERILE CELLS on edge of gills capitate.

Gregarious or scattered. Especially on lawns in our cities everywhere; also among grass by road-sides, in fields, pastures, etc., sometimes on dung-hills. May to September. Throughout the State. Very common.

This must not be confused with *Bolbitius tener* Berk., which is much more delicate and collapses quickly at maturity. When growing in the same place the two are easily distinguished. *Bolbitius tener* is rather rare, but may appear in similar situations. There seem to be some discrepancies in the spore-measurements of *G. tenera* as given by different authors, a fact easily explained by their variability. The gills, too, are usually said to be "broad," while in most individuals they are relatively somewhat narrow.

526. Galera crispa Longyear

Bot. Gazette, 1899, p. 272.

Illustration: Hard, Mushrooms, Fig. 226, p. 278, 1908.

PILEUS 1.5-3 cm. broad, *persistently conic-campanulate,* subacute, rivulose-striate, sometimes rugulose, *brownish-ochraceous at*

apex when moist, whitish-buff elsewhere, glabrous, atomate when dry; FLESH membranous. GILLS adnexed, close to subdistant, rather narrow, *crisped and intervcined,* at first white then ferruginous-brown. STEM 5-9 cm. long, 1-2 mm. thick, slender, base slightly bulbous, hollow, *fragile, pure white or tinged ochraceous,* sometimes faintly striatulate. SPORES very *variable in size and shape,* elliptical, ovate or elliptic oval in some individuals, varying 15 x 13 or 12 x 8, etc., (11-16 x 8-14 micr.), smooth. CYSTIDIA none. STERILE CELLS on edge of gills, capitate.

On lawns, pastures, etc., among grass. June-July. Ann Arbor, Lansing, etc. Infrequent.

This species was described by Longyear from our State. The peculiar, crisped appearance of the gills, and the slight development of the hygrophanous character in the pileus distinguishes it from *G. tenera.* Hard gives an excellent photograph of it.

527. Galera teneroides Pk.

N. Y. State Mus. Rep. 29, p. 39, 1878.

PILEUS 5-20 mm. broad, conic-ovate at the very first, then *campanulate-expanded, soft, very fragile,* sublubricous, hygrophanous, *brownish-cinnamon* and striatulate when moist, paler when dry, glabrous. FLESH membranous. GILLS narrowly-adnate, *narrow,* close, pale brown then ochraceous-cinnamon or watery-brown. STEM slender, 3-6 cm. long, 1-1.5 mm. thick, elastic, straight then flexuous, equal, *slightly toughish,* subpubescent, glabrescent and shining, often striatulate. SPORES elliptical, small, 7-8.5 x 5 micr., smooth, obtuse, pale ochraceous-brown. BASIDIA 18 x 8 micr., inflated above, narrowed-stipitate, 4-spored. STERILE CELLS on edge of gills capitate.

On horse-dung and ground or decayed debris in woods. Ann Arbor, New Richmond. August-September.

Remarkable for the soft, fragile pileus and somewhat toughish, persistent stem; the latter separates from the rather watery flesh of the pileus and is found in good condition after the pileus has collapsed. It has affinities with Bolbitius but the gills are Galera-like. The small spores separate it from related species on dung. It seems close to *G. spartea* Fr., but that species is said to prefer mossy or burned-over places in woods. Furthermore, Massee says the gills of *G. spartea* are broadly adnate, while Ricken says they are narrowly-attached, so that a clear idea of that species is hard to obtain.

528. Galera capillaripes Pk.

Torr. Bot. Club. Bull, No. 26, p. 66, 1899.

PILEUS 8-12 mm. broad, obtusely campanulate, hygrophanous, *pale ferruginous* and faintly striatulate when moist, paler and atomate when dry. FLESH membranous. GILLS ascending adnate, *rather broad, subdistant,* pale, ferruginous. STEM filiform, 2-5 cm. long, *flexuous, tough,* glabrous, concolor, persistently rufous-shining, apex pruinate. SPORES 9-11.5 x 5-6.5 micr., elliptical, smooth, obtuse, epispore ferruginous under microscope. CYSTIDIA none. STERILE CELLS on edge of gills capitate, about 20 x 7-8 micr. ODOR none.

Among grass, near woods. Ann Arbor. September. Infrequent.

Similar to *G. tenera,* but with different spores, smaller size and tough stem. It was originally described by Peck from specimens growing on lawns and grassy places in Ohio.

Section II. Bryogeni. Pileus campanulate-convex, always striatulate; gills scarcely ascending, provided on the edge with filiform, awl-shaped or lanceolate sterile cells. Habitat on mosses, sedges, etc.

529. Galera cyanopes sp. nov.

PILEUS 8-12 mm. broad, convex-campanulate, hygrophanous, pale watery cinnamon and striatulate when moist, whitish-buff and almost even when dry, atomate; FLESH membranous. GILLS adnate, narrow, sublinear, close to subdistant, pale cinnamon-ochraceous, edge minutely flocculose. STEM 5-7 cm. long, 1-1.5 mm. thick, filiform, *pale greenish-gray to bluish,* equal or minutely bulbillate at base, elastic, hollow, pruinose at apex, glabrous elsewhere, concolor within. SPORES broadly elliptical, smooth, 8-9.5 x 6.5-7 micr., ochraceous. CYSTIDIA none. STERILE CELLS on edge of gills. ODOR and TASTE none.

On Polytrichum, a species of moss, in a poplar swamp. Ann Arbor. July. Rare.

A beautiful little Galera, well-marked by the blue-gray stem, habit on Polytrichum and its striatulate pileus when moist. In the light from a kerosene lamp the greenish-blue color is intensified. *G. mniophila* Lasch. is said to grow on moss and has an olive-yellow stem, but the spores are larger, according to Ricken 10-12 x 5-6 micr., and according to Massee, 14 x 6 micr.

530. Galera plicatella Pk.

N. Y. State Mus. Rep. 26, p. 59, 1874 (as *Galera coprinoides* Pk.).

PILEUS 10-12 mm. broad, convex-expanded, *plicate-sulcate* to the small even disk, often split on margin, yellowish or ochraceous when moist, straw-whitish when dry, glabrous. FLESH membranaceous. GILLS adnexed, moderately broad, ventricose, close to subdistant, distinct, pale rusty-ochraceous. STEM 2-3 cm. long, 1 mm. thick, slender, equal, flexuous or straight, hollow, minutely pruinose, *white* to pallid. SPORES elliptical, smooth, 6-7.5 x 5 micr., rusty-ochraceous. BASIDIA 15 x 6-7 micr., 4-spored.

On the grass, lawns, roadsides. August-October. Ann Arbor. Rare.

The pileus imitates small species of Coprinus in its plicate margin. The trama of the gills is composed of large, vesicular subhymenial cells, between which runs a narrow layer of axillary, slender parallel hyphae.

531. Galera hypnorum Fr.

Sys. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 230.
Cooke, Ill., Plate 465.
Gillet, Champignons de France, No. 295 (var. *bryorum*).
Ricken, Die Blätterpilze, Plate 60, Fig. 8.

PILEUS 4-12 mm. broad, campanulate, *cinnamon-yellowish* or yellowish-ochraceous and *striate when moist*, glabrous, yellowish-white or buff and even when dry. FLESH membranaceous; GILLS adnate, *broad, not ascending,* subdistant, fulvous-cinnamon, edge minutely flocculose. STEM short, 3-4 cm. long, 1-2 mm. thick, equal, slender, hollow, flexuous, glabrous, apex pruinose, concolor, often darker toward base. SPORES elliptic-ovate, subinequilateral, 8-10 x 5-6 micr., smooth, ochraceous. CYSTIDIA none. STERILE CELLS on edge of gills *fusiform-lanceolate.*

Gregarious on mosses. Throughout the State. May-October. Common.

This is our commonest little Galera with a moss habitat. Doubtless closely related species are confused with it and a microscopic study may be necessary to distinguish them. A number of varieties have been described, but an account of them here would only con-

fuse the student. Sometimes the pileus is provided with a little umbo, sometimes the plants attain a larger size than that given. A form growing on sphagnum is especially large.

Bolbitius Fr.

(From the Greek, *bolbiton,* cow's-dung.)

Ochre-brown to rusty-ochraceous-spored. Gills *dissolving somewhat* in wet weather, narrowly attached. Margin of pileus at first straight; flesh very thin. Stem fragile and slender. Partial veil very evanescent or none.

Putrescent, delicate, dung-inhabiting fungi, with hollow, elongated stems, with gills which dissolve more or less into a soft mass in age and very thin caps which usually split on the margin. They approach the genus Coprinus in habit and in the structure of the hymenium, differing in the rusty-ochraceous spores. They have something of the appearance of Galera, but their gills are clearly different. Only three species are included below. Some consider *Pluteolus reticulatus* to be a better species of Bolbitius. The genus Pluteolus, in fact, differs only in degree from Bolbitius. Species with free gills and the stem separable from the pileus are referable to Pluteolus; species with gills more or less narrowly attached and with a tendency of the gills to become soft, belonging to Bolbitius. But apparently these characters vary or intermediate forms may occur. The gills of *Pluteolus reticulatus* are sometimes narrowly adnate and those of some species of Bolbitius are free in occasional specimens. The texture of the stem in both genera is different from that of the pileus and the stem is more or less separable. The pileus is viscid or slightly so in nearly all species of both genera. In spite of these facts, the nature of the gills of Bolbitius remains a real distinguishing character and the genus Pluteolus will be retained in its proper place.

Key to the Species

(See Pluteolus)

532. Bolbitius tener Berk.

Outlines, 1860.

Illustrations, Ibid, Pl. 12, Fig. 2.
Cooke, Ill., Pl. 691.
Fries, Icones, Pl. 139, Fig. 4.
Gillet, Champignons de France, No. 46.

PILEUS conical, 1-1.5 cm. high, finally expanded, obtuse, *dull white,* apex creamy-yellow, sometimes slightly subviscid, *even or scarcely striatulate,* glabrous, atomate when dry. FLESH very thin, delicate. GILLS free or nearly so, narrow, close, *dissolving quickly* and becoming brownish-ochraceous. STEM *slender,* 6-12 cm. or more in length, 1-2 mm. thick, equal, *flaccid,* glabrous, hollow, *bulbillate at base, pure white.* SPORES broadly elliptical, smooth, 13-16 x 9-10 micr., rounded-obtuse, ochraceous.

Gregarious or scattered. Among grass on lawns, parks, golf-links.

Marquette, Ann Arbor, Ypsilanti, etc. July-August. After heavy rains. Rare.

This plant must not be confused with *Galera lateritia* which has a larger pileus, a rigid-fragile stem and slightly smaller spores and gills which do not dissolve. This little Bolbitius seldom appears, according to my experience, and only during sultry, rainy weather. It develops overnight and in early morning stands up on its slender stem without difficulty, but soon after the sun strikes it the stems bend over, the gills dissolve and the cap collapses into soft masses which cling to the apex of the flaccid stem. On cloudy days the cap may expand and persist longer but usually it is seen as shown in Cooke's figure. It is described with salmon-colored gills, but in our plants the gills were brownish-ochraceous.

533. Bolbitius fragilis Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 720, A.
Swanton, Fungi, Pl. 40, Fig. 2.

PILEUS 2-5 cm. broad, conical-expanded, subumbonate, more or less viscid, light yellow, fading, umbo slightly deeper yellow, thin, almost pellucid, glabrous, *striate on the margin.* FLESH mem-

branaceous. GILLS narrowly adnate, attenuate behind, sometimes free, *yellow,* then sordid pale cinnamon, moist and *somewhat dissolving.* STEM 7-9 cm. long, 2-3 mm. thick, fragile, hollow, slightly attenuated upwards, *glabrous,* naked at apex, yellow. SPORES elliptical, smooth, 11-13 x 6-7 micr., rusty-ochraceous.

Solitary or gregarious. In cultivated fields. Ann Arbor. May-July. Infrequent.

This is rather difficult of separation from *B. vitellinus.* It differs apparently in its less plicate pileus and the naked, more yellow stem; but these characters are variable in this genus and intermediate forms seem to be quite frequent.

534. Boletinus vitellinus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 923.
Gillet, Champignons de France, No. 47.
Ricken, Blätterpilze, Pl. 23, Fig. 9.

PILEUS 2-5 cm. broad, at first oval, obtuse and *egg-yellow,* at length campanulate-expanded, cinereous toward margin, *sulcate-striate or plicate up to the egg-yellow obtuse umbo,* viscid, glabrous, margin at first straight. FLESH very thin. GILLS narrowly adnate, close, subdistant at full expansion of pileus, narrow, soft, *ochraceous-clay-color and with white edge when young,* rusty-ochraceous in age, *scarcely dissolving in wet weather,* crisped in dry weather. STEM 6-12 cm. long, 2-4 mm. thick, equal or slightly tapering upward, slender, fragile, *pruinose-scaly at apex* or throughout, *white* or slightly sulphur-yellow-tinged, often pellucid-shining, even or innately fibrillose. SPORES elliptical, smooth, 10-12.5 x 6-7.5 micr., rusty-ochraceous. *Hymenium* with large, inflated, sterile cells intermingled with basidia and of the same length as the basidia but much broader. ODOR and TASTE none.

On dung, especially cow dung, in fields, woods, etc., where cows are pastured. Ann Arbor, New Richmond, probably throughout the State. May-July. Rather frequent.

To be looked for in early June. It is a rather variable plant, changing in color as it develops, and again as it ages. Some specimens have white stems, others have stems tinged with sulphur-yellow. The distinctive character is the egg-yellow umbo on the center of the pileus, and before expansion the whole pileus is

yellow. In the very young unexpanded stage, the surface of the pileus is provided with a delicate, thin, viscid pellicle, composed of glistening particles; this membrane disappears as the pileus expands. The species is not uncommon in Sweden, where I was able to verify the identity of our plant. The flesh of the stem is sometimes pale yellow. It should be carefully compared with *Pluteolus expansus*.

Pluteolus Fr.

(Diminutive of *Pluteus*.)

Ochre-brown to rusty-ochraceous spored. Gills *free*, not dissolving in wet weather. Stem *distinct from the pileus*, subcartilaginous. Pileus *viscid*, margin at first straight. Veil none.

Putrescent, thin-capped, slender-stemmed fungi, whose distinguishing characters are the spore-color, free gills, separable stem and viscid pileus. Bolbitius differs by the greater or less degree of the softness of the gills which tend to dissolve in wet weather. In Galera the gills are attached, the stem not truly separable and the cap not viscid. In Naucoria the margin of the pileus is at first incurved. Pluteolus corresponds to Pluteus of the pink-spored group in its free gills. The gills are, however, not always free, but may be attached slightly by the upper corner; this is true in *P. expansus* and *P. reticulatus*, which are somewhat intermediate between Pluteolus and Bolbitius. Ricken has discarded this genus, referring the European species to Bolbitius. A consideration of the extremes as shown by *Bolbitius tener* and *Pluteolus coprophilus* will make it evident that a real basis exists for these two genera. For purposes of identification, however, it seems helpful to include the species of both genera in one key.

Key to the Species

(a) On decaying wood; pileus deep violet-gray, fading. 538. *P. reticulatus* Fr.
(aa) On dung, straw piles, grassy places or ground in woods.
  (b) Gills dissolving quickly; pileus conical, 1-1.5 cm., dull white. (See 532. *Bolbitius tener* Berk.)
  (bb) Gills dissolving slowly or not at all.
    (c) Spores large, 12-16 micr. long, pileus rose-gray, striatulate. 535. *P. coprophilus* Pk.
    (cc) Spores 9-13 micr. long.
      (d) Pileus drab-color to grayish-brown; on the ground in woods. 536. *P. aleuriatus gracilis* Pk.
      (dd) Pileus yellow when young.
        (e) Pileus umbonate, umbo yellow.
          (f) Stem yellow, glabrous; pileus striate on margin. (See 533. *Bolbitius fragile* Fr.)

(ff) Stem white, rarely tinged yellow; pruinose-scaly at apex; pileus sulcate-plicate. (See 534. *Bolbitius vitellinus* Fr.)

(ee) Pileus sulcate-plicate, not umbonate; stem citron-yellow. 537. *P. expansus* Pk.

535. Pluteolus coprophilus Pk.

N. Y. State Mus. Rep. 46, 1893.

PILEUS 2-4 cm. broad, fragile, conical-campanulate then expanded, depressed on disk, *viscid* when moist, striatulate on margin, whitish at first, *soon rosy-gray or pinkish-cinnamon.* FLESH thin, submembranaceous. GILLS *free,* narrow, crowded or close, pale rusty-cinnamon, dotted by the spores. STEM 6-11 cm. long, 2-4 mm. thick, straight or flexuous, *slender,* hollow, *pure white,* rarely tinged with pink, glabrous or obscurely squamulose, equal or attenuated at base. SPORES oval-elliptical, smooth, variable in size, 12-16 *x* 7-10 micr., bright-cinnamon in mass.

Caespitose or gregarious. On decaying straw piles, on compost heaps or on dung, especially on lawns, fields, around trees, etc., where coarse manure was used. Ann Arbor. Probably throughout the State. May-June. Infrequent.

During continued wet and sultry weather it is often very abundant on manure mixed with straw. In June of one year specimens appeared around every tree on the campus of the University of Michigan where such manure had been deposited. Some think *Bolbitius radians* Morg. is identical with it.

536. Pluteolus aleuriatus gracilis Pk.

Syst. Myc., 1821 (as *P. aleuriatus* Fr.).
N. Y. State Mus. Rep. 54, 1901.

PILEUS 1-2 cm. broad, fragile, soon expanded-plane, *viscid,* striate-sulcate on margin, hygrophanous, *drab color to grayish-brown,* paler on depressed disk, glabrous. FLESH thin. GILLS free or nearly so, narrow, close, whitish at first then pale rusty-cinnamon. STEM 2.5-3.5 cm. long, 1.5-3 mm. thick, equal or narrowed upwards, glabrous or minutely pulverulent, hollow, white, or pallid. SPORES elliptical, smooth, 9-12 x 4-6 micr., pale ferruginous.

On the ground among decaying leaves in mixed woods. Houghton, Bay View. July. Rare.

This species does not seem to be very well known. Only a few specimens were found which are here considered to be identical with Peck's variety.

537. Pluteolus expansus Pk.

N. Y. State Rep. 26, 1874 (as *Galera expansus*).

Illustration: Plate XCVIII of this Report.

PILEUS 3-6 cm. broad, *fragile,* oval at first, then expanded-plane, *not umbonate,* slightly depressed in centre, *viscid* when moist, *cinereous-ochraceous* tinged with brownish or greenish hues, margin at first sulphur-yellow, *striate-sulcate or plicatulate.* FLESH thin, submembranaceous. GILLS free or slightly and narrowly adnexed, narrow, close to crowded, at first white, soon ochraceous-cinnamon, edge minutely flocculose. STEM 5-10 cm. long, 2-6 mm. thick, fragile, equal or slightly tapering upward, hollow, sometimes compressed, splitting longitudinally, pruinose or floccose, *citron-yellow,* yellow within except the evanescent pith. SPORES elliptical, smooth, 10-12 x 7.5 micr., ochraceous-cinnamon under microscope. *Hymenium* composed of large, inflated subglobose sterile cells intermingled with basidia which are narrow below, inflated above and 4-spored.

Gregarious or solitary. On rich manured lawns, fields, etc., sometimes on dung; sometimes in woods. Ann Arbor, Houghton, etc. Throughout the State. May-July. Infrequent.

This species seems to differ from *Bolbitius vitellinus* mainly in the absence of the yellow umbo or a yellow centre in the expanded pileus, in the constant yellow stem and the somewhat different distribution of color on the cap. It was first described by Peck from specimens on decaying wood, but later he reported it from "rich ground." The microscopic structure is very similar to that of *Bolbitius vitellinus.* The gills, although rather soft, do not dissolve as in a typical Bolbitius, but are fairly persistent. Var. *terrestris* Pk. is here made an integral part of the species.

538. Pluteolus reticulatus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 495.
Gillet, Champignons de France, No. 546.
Berkeley, Outlines, Pl. 9, Fig. 5.
Ricken, Blätterpilze, Pl. 23, Fig. 10.
Plate CXIX of this Report.

PILEUS 2-5 cm. broad, campanulate-expanded, obtuse, sometimes slightly depressed, *glutinous when fresh,* the gluten drying so as to form *reticulate veins,* radiately-rugose on disk, *violaceous-gray* when fresh, livid to blackish on disk, margin obscurely striate, very pale in age. FLESH rather thin. GILLS almost free or narrowly adnate, rounded behind, *seceding,* crowded, ventricose, moderately broad, whitish at first, then rusty-cinnamon, edge white-fimbriate. STEM 3-6 cm. long, 2-6 mm. thick, equal or slightly tapering upwards, elastic, toughish, *white,* minutely floccose-scaly, fibrillose-striatulate, hollow, straight or curved. SPORES elliptical, smooth, 9-11 x 5-6 micr., rusty-brownish. ODOR none.

Caespitose or subcaespitose. Around the base of stumps and standing trees, on decayed wood. Ann Arbor. October. Rare.

When fresh the plants are markedly tricolored; pileus deep gray with violet tinge, gills rusty-cinnamon and stem white. Later the color of the pileus fades somewhat as in the plates referred to above, all of which show the cap much decolorized. The gills of our specimens depart somewhat from the character of the genus in being narrowly adnate; on this account it was at first referred by the writer to Naucoria. Ricken places it under Bolbitius because of the structure of the gills. In our plants the gills showed no sign of dissolving or becoming soft under the weather conditions in which they were collected.

Naucoria Fr.

(From the Latin, *Naucum,* a nut-shell, referring to the shape of the pileus.)

Ochre-brown or rusty-brown-spored. Stem *subcartilaginous,* hollow or stuffed. Partial veil none or fugacious. Pileus slightly fleshy, convex, *its margin at first incurved.* Spores smooth.

Putrescent, terrestrial or lignicolous, usually small, sometimes

minute, growing on grassy ground, mosses, sticks, decayed wood, or on the ground in various places. They correspond to the genus Collybia of the white-spored group in the nature of the stem, the incurved margin of the young pileus and in habit and habitat. They differ from Pholiota in lacking an annulus; from Flammula in the subcartilaginous stem, and from Galera in the more convex pileus and darker spore-mass. They are usually devoid of any special odor, but may have a slightly disagreeable taste. Their edibility is mostly uninvestigated, and their small size gives them no special value as edible mushrooms.

The PILEUS is slightly more fleshy in many species than in Galera; others have very thin flesh. It may be hemispherical and convex, even conical in a few species, but then it tends to expand and become plane or depressed. It is often somewhat viscid, sometimes hygrophanous, frequently dry. It is rarely striate on the margin. The color is usually ochraceous or of dark shades of fuscous, brown, etc. The surface is glabrous in two sections, (Gymnolae and Phaeotae), flocculose, scaly or silky in the other (Lepidotae). The GILLS are adnate or adnexed, never decurrent, often broad or ventricose. Most of them have differentiated sterile cells on the edge, which gives a paler or white distinctness. A more careful study of the color in the young stage may make it possible to separate species with greater ease. The STEM is often toughish, when dry somewhat cartilaginous. It is short as compared with the species of Galera, except in a few forms growing on sphagnum or dung. The CORTINA is entirely lacking in the first section, slightly developed in the second and third. It is probable that a universal veil is present in some of the species of the third group.

The species of Naucoria are rather numerous and seem to occur over the whole world. Only a comparatively small number are here described, and a careful study needs to be made of many others found in the State. Fries includes 48 species from Europe in his Hymen. Europ. Peck has described 19 from this country. These species all need microscopic study.

Key to the Species

(A) Growing in grassy places or pastures.
  (a) Pileus dark watery brown when moist; hygrophanous. 548. *N. tabacina* Fr.
  (aa) Pileus yellowish or ochraceous.
    (b) Pileus dry, slightly tomentose or silky on margin. 547. *N. pediades* Fr.
    (bb) Pileus more or less viscid.

(c) Stem compressed; gills yellowish at first, some spores angular. 546. *N. platysperma* Pk.
(cc) Stem terete; gills pallid at first; spores never angular. 545. *N. semiorbicularis* Fr.
(AA) Growing in the woods and thickets, on ground, mosses, decayed wood, etc.
(a) Pileus scaly, dark reddish-brown. 549. *N. siparia* Fr.
(aa) Pileus glabrous; on wood.
(b) Pileus 2-4 cm. broad, dark-fuscous, with a separable pellicle. 539. *N. nimbosa* Fr. var.
(bb) Pileus not over 2.5 cm., without a pellicle.
(c) Pileus with marked olivaceous tints. 540. *N. centuncula* Fr.
(cc) Pileus without olivaceous tints.
(d) Pileus with a conical umbo, minute.
(e) Pileus hygrophanous, watery-cinnamon (moist); gills narrow. 543. *N. lignicola* Pk.
(ee) Pileus dark reddish-brown; gills ventricose. 542. *N. triscopoda* Fr.
(dd) Pileus hemispherical or convex.
(e) Pileus cinnamon-brown; gills broad; stem short. 541. *N. horizontalis* Fr.
(ee) Pileus and stem reddish-fulvous or darker, gills yellow; spores minute. 544. *N. bellula* Pk.

Section I. Gymnotae. Pileus; veil none. Spores rusty in mass. (The following species grow on decayed wood.)

**Pileus with a separable pellicle.*

539. Naucoria nimbosa Fr. var.

Hymen. Europ., 1885.

PILEUS 2-4 cm. broad, *convex,* firm, obtuse or subumbonate, even, *dark-fuscous with a rufescent center,* almost blackish-fuscous, wood-brown when dry, *with a subgelatinous separable pellicle,* not viscid, glabrous, subpruinate when dry, veil none. FLESH concolor, pallid when dry, rather thin but compact. GILLS rounded behind, narrowly adnate, medium broad, *crowded,* thickish, fuscous-brown, edge white-fimbriate. STEM 2-4 cm. long, 3-4 mm. thick, stuffed then hollow, equal, straight or curved, *densely white-flocculose above,* fibrillose or fibrillose scaly below, striate, *pallid to fuscous-brown,* dark brown within, *rigid-elastic,* white-mycelioid at base. SPORES 6-7 x 3.5-4.5 micr., elliptical, smooth, rusty-brown. CYSTIDIA scattered on sides of gills, abundant on edge, 35-45 x 10-12 micr., obtuse, ventricose, stout. ODOR none. TASTE sometimes unpleasant, astringent.

On decaying logs or debris in hemlock woods; gregarious. Bay View, New Richmond. September. Infrequent.

This species seems to be intermediate between *N. nimbosa* and *N. cidaris* Fr. It differs from the latter in its flocculose stem and from both in its habitat. The plant is quite well marked by its dark colors, the separable pellicle, firm texture and flocculose stem. The pellicle is composed of erect, clavate cells with fuscous-brown content, and gives to the surface of the cap a gelatinous feel, but is scarcely at all viscid in wet weather. The spores are not genuinely rusty as in the other forms of this section.

***Pileus without a separable pellicle.*

540. Naucoria centuncula Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 601.

"PILEUS 1.5-2.5 cm. broad, convex-expanded, then plane, obtuse, subundulate, hygrophanous, *sooty-olive to brown-olive and delicately striate when moist,* fading to yellowish, dull, silky under lens, margin at first with sulphur-yellow dust. FLESH submembranaceous, concolor. GILLS rounded behind, adnate, *thickish, broad,* crowded, yellow-gray to olive-brown, *edge crenulate with yellowish-green flecks.* Stem 2-3 cm. long, 2-3 mm. thick, often eccentric, equal, *curved,* hollow, sometimes compressed, paler olive, white-mealy above, white-mycelioid at base. SPORES almost kidney-shaped, 6-7 x 4 micr., smooth, rusty-brown. CYSTIDIA 30-36 x 4-6 micr. ODOR mild."

On decayed wood, in frondose woods. Ann Arbor, New Richmond. July-September.

Usually small and known from all others by the olivaceous coloring of the pileus and gills. The description is adapted from Ricken.

541. Naucoria horizontalis Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 601.

"PILEUS .5-1 cm. broad, *hemispherical,* at length depressed, dry, *cinnamon-brown,* even or wrinkled. FLESH relatively thick. GILLS adnexed, *thickish, broad,* close to subdistant, cinnamon-brown, edge white-fimbriate. STEM short and curved, 1 cm. long,

1 mm. thick, brown, naked, base white-mycelioid. Spores somewhat almond-shaped, 14-18 x 6-7 micr., smooth. CYSTIDIA on edge of gills, fusiform, 50-60 x 8-10 mm.

On bark of standing trees (like *Mycena corticola*). Not found with certainty in the State. The description is adapted from Ricken.

542. Naucoria triscopoda Fr.

Monographia, 1863.

Illustrations: Fries, Icones, Pl. 124, Fig. 3.
Cooke, Ill., Pl. 458.

PILEUS 3-10 mm. broad, small, *at first conical*, then campanulate *with a marked acute umbo,* striatulate to the umbo, *chestnut-brown to rufous-brown,* glabrous. FLESH *submembranaceous.* GILLS adnate, ascending, thickish, ventricose, close, ochraceous-cinnamon then darker, edge white-fimbriate. STEM 2-3 cm. long, 1 mm. thick, *slender, reddish-brown,* darker below, glabrous, hollow, apex pruinose, innately silky. SPORES minute, 6-7 x 3-4 micr., rusty-brown, smooth. CYSTIDIA none. STERILE CELLS on edge of gills, slender, subcylindrical, about 35 micr. long.

On much decayed wood in mixed forests of beech and hemlock. Bay View, New Richmond. September. Infrequent.

A dainty little plant, well-marked by its shape and color. The descriptions omit the striations of the pileus, but they are well shown in Fries' excellent figures. Ricken has referred it to the genus Galera but without explanation. This is the plant referred to in the list of the 8th Rep. Mich. Acad. Sci., p. 35, under *N. cuspidata* Pk. (in ed.) which Peck never published. It is clearly Fries' species.

543. Naucoria lignicola Pk.

N. Y. State Mus. Rep. 23, 1872.

PILEUS 5-20 mm. broad, convex-campanulate, markedly umbonate when young, at length expanded and depressed around the small umbo, *hygrophanous, watery-cinnamon* and *striatulate* when moist, dull ochraceous when dry, glabrous. FLESH thin. GILLS adnate, seceding, plane, close to subdistant, *narrow,* cinnamon-brown, edge concolor. STEM 2-4 cm. long, 1 mm. thick, slender, toughish, equal, subfistulose, curved, glabrous or obscurely pruinate-fibrillose.

SPORES elliptic-ovate, inequilateral, 7-8 x 3-4 micr., smooth, rusty-brown. ODOR none. TASTE slightly farinaceous.

On decayed wood. Ann Arbor. July.

Differs from *N. triscopoda* by its hygrophanous, paler pileus and slightly longer spores.

544. Naucoria bellula Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-2.5 cm. broad, firm, moist, convex, obtuse, minutely flocculose or glabrous, even, *bright watery-cinnamon to rusty-fulvous*, pliant. FLESH rather thin, yellowish. GILLS adnate-seceding, sometimes emarginate with tooth, rather narrow, close to crowded, *yellow then rusty-yellow and spotted.* STEM 2-2.5 cm. long, 1-2 mm. thick, slender, equal, short, toughish-elastic, straight or curved, *reddish-brown to rusty-bay,* darker below, stuffed then hollow, fibrillose-scurfy at apex, sometimes scurfy throughout. SPORES *minute,* oval, 5-5.5 x 3 micr., smooth, ferruginous, staining the gills. CYSTIDIA none. TASTE *bitter.* VEIL none.

On decayed coniferous wood in hemlock and pine woods, subcaespitose or gregarious. September. Bay View, New Richmond.

A distinct plant of the conifer regions of the State. The whole plant has a tendency towards a fulvous-rusty more or less red color. The stem and gills become darker colored with age. The identification was made by Peck. It must not be confused with *Flammula limulata* Fr.

Section II. Phaeotae. Pileus glabrous. Spores and gills dull-colored, fuscous, cinnamon or ochraceous. Veil scarcely noticeable. (The following species grow on cultivated ground.)

545. Naucoria semiorbicularis Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 493.
Gillet, Champignons de France, No. 489.
Berkeley, Outlines, Pl. 9, Fig. 4.
Plate XCIX of this Report.

PILEUS 1-3 cm. broad, *hemispherical-convex,* obtuse, somewhat viscid when moist, *fulvous-yellow,* darker on disk, ochraceous in

age, *glabrous,* sometimes rimose, even, veil none. FLESH thin or thickish on disk, pallid. GILLS adnate, often seceding, *broad,* close, *pallid or alutaceous at first,* then rusty-brown, edge white-fimbriate. STEM 4-6 cm. long, 1-3 mm. thick, equal or slightly thickened toward base or apex, subrigid, toughish, *terete,* somewhat silky-shining, stuffed by a white pith, *ochraceous,* darker in age. SPORES elliptical-oval, 12-15 x 8-9 micr., smooth, rusty-brown in mass. CYSTIDIA on edge of gills ventricose flask-shaped, sometimes capitate, 25-35 x 9 micr. ODOR none. TASTE slightly disagreeable.

Gregarious or scattered. On lawns, roadsides and grassy pastures. Throughout the State. May-September. Common.

This species occurs on lawns with *Psilocybe foenisecii* and *Pholiota praecox,* during the warm and rainy weather in May and June, although it may be found throughout the season. Its hemispherical cap and rusty-brown spores distinguish it from similar species of the purple-brown-spored group. Its spores and size separate it from nearby species of Naucoria. *N. verracti* Fr. has been reported from Ohio. According to Ricken, this has spores measuring 12-17 x 8-12 micr. Its stem is said to be rough-fibrillose.

546. Naucoria platysperma Pk.

Torr. Bot. Club, Bull. 25, p. 324, 1898.

PILEUS 2-4.5 cm. broad, *convex* then subexpanded, slightly viscid when moist, *ochraceous,* somewhat darker when young, glabrous, fading, even, veil slight. FLESH white, thick on disk. GILLS adnate, broader behind, close, thin, *yellowish-ochre at first* then fuscous-cinnamon, edge pallid-fimbriate. STEM 3-5 cm. long, 2-4 mm. thick, tough, *hollow and usually compressed,* equal or tapering below, *ochraceous,* often striate above, slightly flocculose with whitish floccules. SPORES 13-15 x 7-10, elliptical, or *sometimes of various shapes, triangular, heart-shaped, lobed, etc.,* fuscous-brown in mass. STERILE CELLS on edge of gills fusiform.

Gregarious. On dung-hills, pastured woods and grassy places. Bay View, Ann Arbor, New Richmond. May, June and September. Frequent during some seasons.

Characterized by the flattened or irregular spores which are present in each mount, although in small numbers. The size of the plant and its compressed stem are often good marks for its identification. Peck gives a greater width for the spores, but this is rare in our plants, which were referred to him and verified. The original description was made from California specimens.

547. Naucoria pediades Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 492.
Gillet, Champignons de France, No. 488.
Patouillard, Tab. Analyt., No. 346.
Hard, Mushrooms, Fig. 228, p. 282, 1908.

"PILEUS 2.5-6 cm. broad, campanulate-hemispherical, at length plane, obtuse, *dry, not shining,* fulvous-ochraceous then isabelline-yellow, *delicately tomentulose toward margin,* margin silky-floccose. FLESH pallid, slightly fleshy. GILLS broadly adnate, rounded behind, rather broad, close to subdistant, ventricose, *brownish-pallid at first,* at length sordid-brown. STEM 4-7 (or more) cm. long, 2-3 (or more) mm. thick, often twisted, unequal, *stuffed,* silky-fulvous, concolor or yellowish, *granular-flocculose.* SPORES oval, 10-12 x 6-7 micr., argillaceous-brown in mass. CYSTIDIA (on edge) ventricose-fusiform, 45-50 x 8-10 micr. ODOR subfarinaceous. TASTE sometimes nauseous."

Reported as common on lawns and roadsides by Longyear. Description adapted from Ricken.

548. Naucoria tabacina Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 493.

PILEUS 6-18 mm. broad, convex, obtuse, *then almost plane,* glabrous, *hygrophanous,* even, *watery bay fuscous* (moist), dull ochraceous-cinnamon (dry). FLESH concolor, thin. GILLS adnate-seceding, narrowed in front, rather broad behind, close, at length horizontal, alutaceous-brownish, edge white-flocculose. STEM 2-3 cm. long, 1-3 mm. thick, *tapering downward,* straight or curved, stuffed then hollow, toughish, *brownish-umber, fibrillose-floccose.* SPORES elliptic-ovate, 6-8 x 4-4.5 micr., smooth, fuscous-brown in mass. ODOR none. TASTE bitterish.

Caespitose or subcaespitose, on the ground in a cornfield, etc. Ann Arbor. June. Infrequent. Known by its dark colors and small spores. The gills often run down the stem by a line.

Section II. Lepidotae. Pileus flocculose or scaly. Veil manifest (universal). Spores rust-colored.

549. Naucoria siparia Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 480.
Patouillard, Tab. Analyt., No. 642.

PILEUS 5-15 mm. broad, broadly convex to plane, obtuse, moist, at first densely tomentose, *breaking up into thick scales of fascicled tufts,* especially on disk, *dark reddish-brown.* FLESH soft, brownish-ochraceous, thin. GILLS adnate, *broad,* close to subdistant, ventricose, brownish-clay-color, edge white-flocculose. STEM 1-2 cm. long, 1-1.5 mm. thick, short, equal, stuffed, lower two-thirds *loosely floccose-fibrillose and reddish-brown,* apex glabrous and whitish. SPORES very variable in size and shape, 9-13 (few 15) x 5-6 (few 7) micr., inequilateral-elliptical, smooth, rusty-brown in mass. CYSTIDIA none. STERILE CELLS on edge of gills numerous, subcylindrical or narrowly clavate, about 40 x 8-9 micr. BASIDIA 4-spored, 27 x 6 micr. ODOR none.

Gregarious, on soil or moss in frondose woods, among debris. Ann Arbor. August.

Although this plant is said to usually inhabit the stalks of ferns, our specimens agree so closely with the descriptions that scarcely a doubt can be raised concerning their identity.

Crepidotus Fr.

(From the Greek, *krepis,* a slipper and *ous,* an ear.)

Ochre-brown to rusty-spored. Stem lateral, eccentric or none. Pileus dimidiate, eccentric or lateral, often at first resupinate. Veil lacking. SPORES sphoeroid or elliptical.

Putrescent, shelving or resupinate mushrooms, from 1 to 5 cm. broad, growing on decaying wood. They correspond to those Pleuroti of the white-spored group which have no veil.

The PILEUS is usually of a soft consistency and soon collapses; in some species it is firmer or tougher and a few have a gelatinous surface layer. The surface of some forms is tomentose or hairy, of others glabrous; when hygrophanous, they often become pruinose when dry. The hygrophanous species are usually striatulate on the margin of the pileus when moist, but become even when dry. The color of most species is white, dingy-white or yellowish, but *C. cinnabarinus* has a deep scarlet-red color. The GILLS radiate

from the point of attachment of the pileus, where they either run down to a point or are abruptly rounded behind. They are often broad and soft and collapse when mature, but sometimes are very narrow and crowded; in age they become stained or spotted by the copious spores. The short STEM or tubercle-like point of attachment is usually somewhat tomentose or villose even in otherwise glabrous plants. The SPORES are an important means of diagnosis of the species of this genus, since a number of species have a very similar general appearance. Peck points out that European mycologists have neglected to give us careful measurements for the spores of their species. I have used the spore character in the keys, since it is the only reliable method of studying the group, and as the species are not as a rule used for food, the mycophagist will not need much attention. The spores in different species vary from brown to ferruginous and often stain the pilei when the latter grow in an imbricate fashion.

Fifteen species are reported from Michigan; all but two I have collected.

Key to the Species

(A) Spores elliptical or oval.
  (a) Pileus scarlet-red, substipitate. 555. *C. cinnabarinus* Pk.
  (aa) Pileus not red.
    (b) Pileus viscid, hygrophanous, sessile, white when dry. 550. *C. haerens* Pk.
    (bb) Pileus not viscid.
      (c) Pileus with a subgelatinous surface, sessile, glabrous. 551. *C. mollis* Fr.
      (cc) Pileus not gelatinous.
        (d) Pileus distinctly stipitate, minutely scaly, 4-8 mm. broad, tawny, tinged gray. 556. *C. sepiarius* Pk.
        (dd) Pileus sessile.
          (e) Pileus glabrous, whitish, resupinate. 552. *C. albidus* E. & E.
          (ee) Pileus not glabrous.
            (f) Pileus covered by a white villosity or tomentum.
              (g) Pileus 4-10 mm. broad; spores 7.5 micr. long. 553. *C. herbarum* Pk.
              (gg) Pileus 8-20 mm. broad; spores 9-10 micr. long. 554. *C. versutus* Pk.
            (ff) Pileus covered by a dense dark-colored tomentum when young.
              (g) Spores 8-10 x 5-6; pileus with a thin tawny tomentum, hygrophanous. 557. *C. fulvotomentosus* Pk.
              (gg) Spores 5-6 x 4-4.5; pileus with a rufous-brown tomentum, not hygrophanous. 558. *C. calolepis* Fr.

(AA) Spores spherical.
  (a) Pileus white or whitish.
    (b) Pileus subtomentose, densely villose at base; gills broad; spores 6-7 micr. 559. *C. putrigenus* B. & C.
    (bb) Pileus glabrous except at attachment.
      (c) Stipitate, stem 2-4 mm. long; pileus usually marginate behind. Spores 5-5.5 micr. 562. *C. stipitatus* sp. nov.

(cc) Not stipitate, i. e., pileus sessile.
(d) Gills narrow and decurrent; spores 4-5.5 micr. 561. *C. applanatus* Fr.
(dd) Gills broad, rounded behind; spores 5.5-7 micr. 560. *C. malachius* B. & C.
(aa) Pileus not white.
(b) Pileus flabelliform, narrowed to the base, ochraceous; gills concolor. Spores 4.5-5.5 micr., with a cavity on one side. 563. *C. crocophyllus* Berk.
(bb) Pileus dimidiate or subreniform, reddish-yellow, tomentose-scaly; spores 6 micr. 564. *C. dorsalis* Pk.

(*C. distans* Pk. has an *eccentric* stem; pileus small, 4-8 mm., *sulcate-striate,* pubescent and *tawny,* spores elliptical, 10-12 x 6-7.5 micr.; the gills are very distant. *C. latifolius* Pk. came from Ohio; pileus is sessile, 3-6 mm. broad, *hygrophanous,* white, almost glabrous; gills *very broad;* spores globose, 5-6 micr. *C. croceotinctus* Pk. has a pileus 1.5-2.5 cm. broad, *glabrous,* sessile, yellowish; gills whitish *becoming dull saffron-yellow;* spores short elliptical, 5-6 micr. long.)

550. Crepidotus hærens Pk.

N. Y. State Mus. Rep. 35, 1884.

PILEUS 1-5 cm. broad, rarely broader, sessile, flattened-convex, dimidiate, reniform, broadly cuneate, etc., *hygrophanous, viscid* from the thin but tough, gelatinous, separable cuticle, glabrous or slightly floccose-squamulose, obscurely striatulate when moist, watery-brown or tinged gray (moist) white or whitish (dry), white-villose at the base, margin at first inrolled. FLESH thin. GILLS close, narrow, radiating, whitish then brownish. SPORES broadly ovate-elliptical, obtusely pointed at ends, smooth, 7-9 x 5-6 micr., pale rusty-cinnamon in mass.

On decaying woods of deciduous trees. In Washtenaw County it was found in several localities, but not detected elsewhere. June-September. Infrequent.

This is our only truly viscid Crepidotus; *C. mollis* may become slightly so in very wet weather. Our plants average larger than those described by Peck, and the spores are slightly longer.

551. Crepidotus mollis Fr.

Syst. Mycol., 1821.

Illustrations: Swanton, Fungi, Pl. 40, Fig. 10-12, 1909.
Gillet, Champignons de France, No. 262.
Ricken, Blätterpilze, Plate 61, Fig. 1.
Cooke's Ill., Pl. 498.

PILEUS 1-5 cm. broad, rarely broader, sessile or subsessile, *soft,* obovate to reniform, soon plane *with a gelatinous cuticle* which gives it a gelatinous feel, sometimes subviscid, flaccid, *glabrous,* substriate on the margin, livid (moist) becoming ochraceous-whitish (dry). FLESH thin. GILLS *narrow, crowded,* decurrent, radiating, whitish then cinnamon. SPORES elliptical-ovate, subacute at one end, rounded at the other, smooth, 7-8.5 x 4-5 micr. ODOR and TASTE not noticeable.

Often imbricated, on decaying logs and limbs. New Richmond. September. Rare.

C. mollis differs from *C. lacerus* in that the gills are more crowded and narrow, the spores are slightly smaller and the surface is not viscid as a rule, even when moist and fresh.

552. Crepidotus albidus E. & E.

Proceedings Amer. Acad. of Phila., 1894.

"PILEUS sessile, *resupinate at first,* whitish, *glabrous,* dry, margin incurved. GILLS thin, rather broad, pallid then yellowish-brown, radiating from a point. SPORES unequally elliptical, yellowish-brown, 5 x 3.5 micr. On bark of tilia, Ann Arbor."

This species has not been recognized, apparently, since it was described. It is included as a basis for further observation. It approaches *C. latifolius* but the spores are not spherical and the pileus is not hygrophanous. Specimens of the type material are in the University of Michigan herbarium. It is very close to the following.

553. Crepidotus herbarum Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 3-10 mm. broad, sessile, resupinate, suborbicular, *clothed with a white, downy villosity,* incurved on the margin when

young, sometimes becoming reflexed. GILLS rather narrow, subdistant, radiating from a naked lateral or eccentric point, white, then subferruginous. SPORES elliptical, 6-7.5 x 3-4 micr."

On dead stems of herbs, decaying wood, etc., in woods. Throughout the State. June to November. Frequent.

This little species grades into the next, but the spores seem to be constant. The pileus is often only villose toward the base.

554. Crepidotus versutus Pk.

N. Y. State Mus. Rep. 30, 1878.

Illustrations: Atkinson, Mushrooms, Fig. 150, p. 160, 1900.
Hard, Mushrooms, Fig. 227, p. 280, 1908.

"PILEUS 8-20 mm. broad, at first resupinate, then reflexed, reniform or dimidiate, sessile, white, *clothed with a soft, downy or tomentose villosity,* incurved on the margin. GILLS rather broad, subdistant, rounded behind, radiating from a lateral or eccentric point, whitish then ferruginous. SPORES subelliptical, 9-10 x 6-7.5 micr."

On logs, decaying wood, etc., in woods. Throughout the State. June to October. Frequent.

The larger spores and size of pileus distinguish *C. versutus* from *C. herbarum.*

555. Crepidotus cinnabarinus Pk.

Torr. Bot. Club, Bull. 22, 1895.

PILEUS 5-10 mm. broad, subsessile to slightly stipitate, soon reflexed lateral, *scarlet* to cinnabar-red, villose-tomentose, glabrescent, even on the margin. GILLS rather broad, subdistant, sinuate behind, *scarlet on edge,* which is minutely fimbriate-crenulate. STEM short, 1-2 mm. long, or almost lacking, lateral, minutely reddish-tomentose, continuous with the base of the pileus on the upper side. SPORES elliptical-oval, 7-9 x 4.5-5.5 micr., smooth, pointed at one end, slightly tinged reddish. BASIDIA 20-25 micr. long by 7-9 wide, with 1, 2 or 4 sterigmata.

On decaying bass-wood log, etc., in low moist woods, southeast of Ann Arbor. September-November. Rare.

This brilliant red but small species was rediscovered by the writer years after it was first collected, when it was sent to Peck from Ann

Arbor by L. M. Johnson, then instructor in Botany in the University. All efforts to get a definite spore print failed, as my plants were collected November 12 and the spores matured slowly in the cold atmosphere. Under the microscope they had a slight tinge of red like that of the edge of the gills and pileus, and some uncertainty remains as to whether the form should not be referred to Claudopus. Quite a number of the spores were abnormal, and in one case one spore grew from the side of another which was the only one attached to that basidium. The *trama of the gills* is composed of narrow, parallel hyphae, 3 micr. thick, hyaline towards the pileus but filled with a red homogeneous substance toward the edge of the gills, where the hyphae terminate in inflated, *sterile,* oval or elliptical *large cells;* this coloring matter gradually breaks up into refractive red globules. The *trama of the pileus* is hyaline toward the gills, composed of interwoven narrow, long hyphae, about 6 micr. thick, which become narrower toward the surface of the pileus and are filled with the red coloring matter, finally ending in tufts or fibrils which stand out from the surface and are intensely scarlet-red.

556. Crepidotus sepiarius Pk.

Torr. Bot. Club, Bull. 25, 1898.

"PILEUS 4-8 mm. long, convex, subumbilicate, even, very minutely scaly, *grayish-tawny.* GILLS adnexed, minutely crenulate on edge, tawny. STEM short, 2-4 mm. long, curved, *generally eccentric,* rarely central, brownish, sometimes mealy or pulverulent. SPORES broadly elliptical, 9-10 x 6 micr., nucleate.

On oak rails. Michigan Agricultural College grounds. Leg. Prof. W. J. Beal. January.

The grayish tint of the pileus is due to the minute, grayish floccose squammules." When central-stemmed the species might be mistaken for a Naucoria. I have not collected it.

557. Crepidotus fulvotomentosus Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-5 cm. broad, scattered or gregarious, suborbicular at first then reniform or dimidiate, sessile or attached by a short, villose tubercle, *hygrophanous,* densely tawny tomentose when

young, *tomentum breaking up into small, tawny scales as pileus expands,* i. e., variegated, ochraceous beneath the tomentum, margin at first incurved. FLESH firm, thin. GILLS medium close, broad, subventricose, radiating from the tubercle, rusty-tan color, *white-fimbriate on edge.* SPORES elliptical-ovate, inequilateral or with a depression on one side, 8-10 x 5-6 micr., rusty-ochraceous.

Gregarious. On decaying wood, logs, etc., of frondose trees. Throughout the State. Recorded from June 9 to October 12. Common.

This differs from *C. calolepis*, if my motion is correct, by its spores and the tinge of red in the color of the pileus. It is very close to *C. calolepis*, but if the spores are constant must be kept separate. Both are distinguished from other species by the dense tomentum when young, which breaks up into separate but small hairy scales. Both are rather persistent and may remain on logs in a dry condition for quite a time. Peck says the cuticle of *C. fulvotomentosus* is separable. It sometimes forms large colonies with pilei of all sizes.

558. Crepidotus calolepis Fr.

Vet. Ak. Förhandl., 1873 (Hymen. Europ. 1874).

Illustrations: Fries, Icones, Pl. 129, Fig. 4.
Cooke, Ill., Pl. 499.

PILEUS 1-2 cm. broad, suborbicular when young, convex, twice as wide as long, sessile or attached by a white villose tubercle, reniform or dimidiate, *not hygrophanous nor gelatinous,* covered by a dense *reddish-brown* tomentum when young, breaking up into rufous scales on expanding, margin at first incurved. FLESH firm, thin. GILLS radiating from the obsolete stem, those in the center not always reaching the inner point of the radius, medium close, *broad*, rusty ochraceous at length, edge minutely, white villose. SPORES *oval,* 5-6 x 4-5 micr., smooth, fuscous-brown in mass.

On dead branches of basswood. Houghton. July. Infrequent or rare.

Differs from the preceding in the character of the tomentum, scales and spores. It was at first considered undescribed, as no spore-measurements were found in European descriptions. The spores of this and the preceding species are certainly distinct and they must be kept separate. The plants found were smaller than is usual for *C. fulvotomentosus.*

559. Crepidotus putrigenus B. & C.

Annals Nat. Hist., 1859.

PILEUS 3-9 cm. broad, sessile, dimidiate or subreniform, convex to conchate or subexpanded, *densely short villose-tomentose,* lustre *dull, whitish or yellowish-white,* moist or watery, even on margin when dry, margin incurved. FLESH thickish behind, white (dry) under the somewhat separable pellicle. GILLS *close, broad* (width 4-5 times the thickness of the flesh), radiating from the villose basal tubercle, narrowed in front, rounded-adnate behind, becoming crisped on drying, *edge entire.* SPORES *spherical,* smooth, about 6 micr. diam., rusty-fuscous. BASIDIA 4-spored. CYSTIDIA none. ODOR rather disagreeable. TASTE tardily somewhat nauseous.

Gregarious or imbricate on decaying logs, stumps, etc., of mixed woods. South Haven and New Richmond. July to September. Infrequent.

Whether this species is a mere form of *C. malachius* is hard to determine. The spores are alike, but in our plants the pileus averaged a large size (for a Crepidotus) and its surface was villose throughout, the villosity becoming denser at the base; this may be the result of luxuriant development. All my collections of *C. malachius* average smaller, and the pileus is glabrous except the base. The gills are somewhat closer than in *C. malachius,* and I am not certain that the pileus is truly hygrophanous. It would seem that the villose, non-hygrophanous, large pileus with margin not striate (dry) and the closer gills separate it.

560. Crepidotus malachius B. & C.

Annals Nat. Hist., 1859.

Illustrations: Peck, N. Y. State Mus. Bull. 122, Report for 1907, Pl. 112, Fig. 1-4.
Conn. Survey, Bull. 3, Pl. 22, p. 43.

PILEUS 1-4 cm. broad, convex to plane, varying subreniform, cuneiform or flabelliform, often depressed behind, *sessile or with a very short, white, tomentose stem,* hygrophanous, watery in wet weather, *glabrous* except above attachment, watery-white, *grayish-white or hoary, striatulate on margin* (dry) as well as at first, sur-

face with a slight gelatinous feel. FLESH firm at first, becoming soft. GILLS almost close, *broad, rounded or abruptly narrowed behind* but reaching the stem-like base, ventricose, thin, whitish then tinged flesh color, finally rusty-brown. SPORES spherical, smooth, 6-7 micr. diam., rusty-brown.

Var. *plicatilis* Pk. has a deeply striate pileus. Found at Bay View.

On decaying wood of frondose trees. Throughout the State. June to November. Common.

The smaller size, presence of striations on the margin of the pileus even when dried, the glabrous surface of the pileus and its tinge of gray, for the most part distinguish this species from the preceding. From *C. applanatus* it is easily separated by the gills, which in the latter species are very narrow toward the base and run together almost in lines.

561. Crepidotus applanatus Fr.

Epicrisis, 1836.

PILEUS 1-3 cm. broad, variable in shape, suborbicular, reniform, cuneiform or spatulate, convex, soon plane, often depressed behind, sessile or with a short, compressed, white, tomentose base, *glabrous, hygrophanous,* watery-white and striatulate on the margin when moist, white when dry. GILLS *very narrow, decurrent, crowded,* white then cinnamon. SPORES globose, 5-6 micr. diam., smooth.

Gregarious on decayed wood, logs, stumps, etc. Ann Arbor, New Richmond. September. Infrequently found.

Known from the other species by its crowded, narrow gills which taper almost to lines where they reach the stem. The pileus becomes convolute on drying and often retains its striations on the thin margin. It has not been found in the State very often, but is probably widely distributed. Ricken interprets it differently, assigning to it elliptical spores.

562. Crepidotus stipitatus sp. nov.

PILEUS 1-3 cm. broad, *convex,* suborbicular to reniform, *hygrophanous, glabrous,* watery-white to white, *stipitate,* faintly striatulate on the margin when moist, silky when dry, margin decurved. FLESH white, firm, rather thick behind, thin in front. GILLS

somewhat close, rather broad, broadest behind, narrow in front, white then pale ochraceous-brown, edge entire. STEM distinct, 2-4 mm. long, *eccentric to nearly lateral,* 1-1.5 mm. thick, equal, white, pruinose, villose at base, somewhat prolonged to the gills. SPORES spherical, 5-6 micr. diam., smooth, pale ochraceous-brown. ODOR and TASTE not noticeable.

Gregarious, on very rotten wood. Low swampy woods. Ann Arbor. September. Found but once.

The texture is rather firm; the stipitate character separates it from *C. malachius,* and the globose spores from *C. sepiarius.* The pileus is marginate behind and with a minute, floccose tuft on the side of the stem. *C. tiliophila* Pk. and *C. haustellaris* Fr. are also said to have a short stem, but the pilei of these are brown or alutaceous and their spores are elliptical.

563. Crepidotus crocophyllus Berk.

Dec. Hooker's Jour., 1856.

PILEUS 1-3 cm. broad, reniform to flabelliform, *convex,* slightly lobed, narrowed into a stem-like base, delicately hairy or glabrous in front, *basal half covered with a dense cottony white tomentum,* watery-ochraceous when moist, *becoming pale chrome when drying,* even on margin. GILLS rather broad, close, thickish, converging at the very base, ochraceous-buff, becoming rusty-ochraceous from the spores. SPORES spherical, 4.5-5.5 micr., *with a depression or cavity on one side,* ochraceous under the microscope.

Scattered on decaying beech log. Bay View. September. Rare.

Originally collected at Waynesville, Ohio, in 1844 by Thomas G. Lea, and named by Berkeley, along with a list of other fungi sent to him by the same collector. (See Cinn. Soc. of Nat. Hist., Vol. 5, 1882, p. 199.)

Our plant was at first referred to *C. ralfsii* B. & Br., but it is much more like Lea's plant. The ground color of the pileus and gills is yellow to ochraceous, and the peculiar spores add a definite distinguishing character. It is close to *C. dorsalis.*

564. Crepidotus dorsalis Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 1-3 cm. broad, convex, sessile, at first suborbicular, then

reniform or dimidiate, *reddish-yellow to tawny-yellow when fresh,* fading to grayish-brown, *adorned with small, tawny, fibrillose scales,* scarcely striate on the margin, which is decurved. FLESH pliant, thin. GILLS close, rather broad, slightly ventricose, rounded behind, *yellow at first,* becoming ochraceous-fuscous then rusty, radiating from the villose point at the attachment of the pileus. SPORES spherical, 6 micr. diam., smooth, nucleate.

On decaying logs and rotten wood, in low swamps. Ann Arbor, New Richmond. July to September. Infrequent.

The color of the pileus varies from a strong tinge of red in some specimens to no red in others. At times the species may be easily taken for small forms of *Claudopus nidulans,* as the coloring is somewhat similar. The young growing specimens are entirely tomentose-squamulose, forming a variegated surface when the pileus is expanded. The perfectly globular spores as well as the absence of a white tomentum on the basal part of the pileus separate it from *C. crocophyllus.* It is probably found throughout the State.

RHODOSPOREAE

Volvaria Fr.

(From the Latin, *Volva,* a wrapper.)

Pink-spored. Stem provided at its base with a *volva* which is formed from a discrete *universal veil; without an annulus;* stem *separable* from the pileus. Gills *free,* ventricose, rounded behind.

Terrestrial or lignicolous. With the exception of *V. bombycina* and *V. speciosa,* the species are small and rather rare. They correspond to Amanitopsis of the white-spored group, and differ from all the pink-spored, except Chamaeota, in the free gills, the volva, and the separable stem. *V. bombycina* is known to be edible; the others are mostly poisonous.

The PILEUS is soft in texture, corresponding in this respect with the Amanitas. Its surface may be glabrous or beautifully silky, in a few species viscid, margin even or striate. Most of them have a whitish pileus, but a few vary to grayish or brown. The GILLS are broad, ventricose, do not reach the stem, and are soft as in Amanita. The STEM is glabrous, silky or villose, some covered with minute spreading hairs; there is no distinct cortex, but a few species are said to be partly hollow. We need more accurate information concerning the interior stem-structure of the rarer species.

The VOLVA is membranous and persists at the base of the stem; in all our species, except one, it splits apically and leaves no shreds on the pileus, showing the splitting in the form of lobes which are often quite constant for a particular species. There is *never* any ANNULUS. The SPORES are rounded, i. e., not angular, smooth, rose-colored, sometimes nucleate. CYSTIDIA are present in *V. volvacea* Fr., *V. pusilla* Fr., *V. murinella* Quel. and *V. speciosa* Fr. I have followed Patouillard's idea of the species of Europe.

Key to the Species

(a) On tree trunks, large; pileus very silky, white; volva large, firm, tough; spores 6-7 x 5 micr. 565. *V. bombycina* Fr.
(aa) On the ground, among grass, herbs, etc., in woods, on dung or manured places.
(b) Pileus viscid, grayish-white or smoky-gray; odor disagreeable; rather large.
(c) Pileus striate on margin, smoky-gray; gills flesh color, without cystidia. 567. *V. gloiocephala* D. C.
(cc) Pileus even on margin; gills rosy, cystidia present. 566. *V. speciosa* Fr.
(bb) Pileus only slightly viscid, or not at all.
(c) Pileus umbonate, striate; stem glabrous and solid. 568. *V. umbonata* Pk.
(cc) Pileus not markedly umbonate.
(d) Pileus 5-8 cm. broad, grayish-brown, blackish-brown on disk, streaked with black fibrils; spores small, elliptic-ovoid. *V. volvacea* Fr.
(dd) Pileus less than 5 cm. broad, whitish.
(e) Stem densely villose with minute spreading hairs; growing in woods. 569. *V. pubescentipes* Pk.; *V. plumulosus* Quel.
(ee) Stem glabrous, except at the very base.
(f) Pileus at length striate or rimulose on margin, white, dry.
(g) Spores subglobose, 7.5 micr. long; stem rather long, 3-4 cm., gills narrow. *V. striatula* Pk.
(gg) Spores truly elliptical, 6-8 x 4-5.5 micr.; stem 1-2 cm.; gills medium broad. 571. *V. pusilla* Fr.
(ff) Pileus not striate, 1-3 cm. broad, conico-campanulate, dry, silky, white or ashy-tinged; stem solid, pubescent; volva bilobed. 570. *V. hypopithys* Fr.

565. Volvaria bombycina Fr. (Edible)

Syst. Mycol., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 134, p. 141, 1900.
Hard, Mushrooms, Pl. 29, Fig. 191-3, 1908.
McIlvaine, American Fungi, Pl. 59, 1900.
Michael, Führer f. Pilzfreunde, Vol. III, No. 102.
Plate C of this Report.

PILEUS 5-20 cm. broad, globose-ovate at first, then campanulate

or convex-expanded, obtuse, *white, very silky,* in age somewhat squamulose, even on margin, edge floccose. FLESH rather thin, white, soft. GILLS free, *remote,* broad, very *ventricose, crowded,* flesh color, edge eroded. STEM 8-20 cm. long, 1-1.5 cm. thick, solid, glabrous, tapering upward, usually curved, white, deeply inserted at the base into the *large, thick, loose* VOLVA, which splits at apex, and persists as an ample bag-like or cup-like sheath, sometimes entire, sometimes torn. SPORES oval to broadly elliptical, 6-8 x 5.5 micr., smooth, rosy in mass.

Solitary or few together on trunks of living trees or decayed wood, of maple, beech, elm, horse-chestnut, etc.; usually from a crack or wound. Throughout the State. July-September. Infrequent.

A noble mushroom, often ensconced on a tree trunk out of reach, its perfect shape and silky dress evoking admiration from everyone. In the egg-stage it reminds one of the large Phalloids. Brought into the house at this stage, and placed in a drinking-glass with a moist cloth about its base, it will expand in all its perfection. It has not been shown as yet that it lives parasitically on the trees from which it grows. Once located, it may be looked for each succeeding year on the same spot. A maple tree on the campus of the University of Michigan is the home of one which fruits regularly every summer. It attains a considerable size. The species occurs throughout the world.

566. Volvaria speciosa Fr. (Poisonous)

Syst. Mycol., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 640.
Ricken, Blätterpilze, Pl. 70, Fig. 1.
Cooke, Ill., Pl. 297.
Bresadola, Fungh. mang. e. vel., Pl. 44.
Gillet, Champignons de France, No. 714.

PILEUS 5-10 cm. or more broad, globose-ovate at first, then expanded to plane, subumbonate, *very viscid, glabrous, white* or tinged gray, margin *not striate.* FLESH thin, soft, putrescent. GILLS free, crowded, rather broad, *ventricose,* deep flesh-color or rosy. STEM 10-20 cm. long, 1-2 cm. thick, equal or nearly so, *at first villose,* glabrescent, base tomentose, white. VOLVA large, splitting apically, close-fitting, flaccid, edge torn. SPORES large, broadly-elliptical, smooth, variable in size, 12-18 x 8-10 micr. CYSTIDIA

clavate, obtuse. ODOR strong and disagreeable at times, especially when old.

Solitary or gregarious. On manured ground, dung, rich leaf-mould in woods; often in rich cultivated fields. So far found in the southern half of the State only. May, June and July. Infrequent.

Atkinson says plants from Lansing, found in a potato patch, had the odor of rotting potatoes. Sometimes the *odor* is not evident, *especially when the plant is young.* Solitary specimens occur in low woods and are somewhat smaller, but in all cases the large, broad spores are characteristic and separate it from the next species. It is considered poisonous in Europe, but McClatchie, in California, reports it perfectly safe. Bresadola warns against confusing it with *Lepiota naucina* and *Palliota campestris.*

567. Volvaria gloiocephala Fr. (Poisonous)

Syst. Mycol., 1821.

Illustration: Patouillard, Tab. Analyt., No. 224.
Bresadola, Fung. mang. e. vel., Pl. 45.
Gillett, Champignons de France, No. 711.
Ricken, Blätterpilze, Pl. 70, Fig. 2.
Cooke, Ill., Pl. 298.

PILEUS 5-10 cm. broad, ovate at first then campanulate-expanded to plane, obtuse, sometimes umbonate, glabrous, viscid to glutinous when moist, *smoky-gray to pearl-gray*, with a metallic luster when dry, margin striate. FLESH thin, fragile, white. GILLS free, rather close, broad toward front, narrowed behind, subventricose, edge concolor. STEM 8-15 cm. or more long, 1-2 cm. thick, tapering upward, solid, even, glabrous above, somewhat villose toward base. VOLVA thin, splitting apically or circularly, sometimes three-lobed, sometimes regular or lacerated on edge, adherent, externally tomentose. SPORES 11-13 x 6-7.5 micr., elliptical, smooth, flesh color. CYSTIDIA none. ODOR and TASTE disagreeable, quite strong.

Solitary. On decaying vegetation, old leaves, rotten wood, in low woods. August. Ann Arbor. Rare.

Except for the darker colors, smaller spores, striations on the pileus and lack of cystidia, this seems close to the preceding, and might perhaps be considered as a variety of it. The spores and colors in these two species are very variable and no doubt intermediate forms occur. Striations are never very satisfactory characters to separate species, although they are useful. The species is con-

sidered *very poisonous,* and if so, is easily confused with *V. speciosa.* The authors note that the volva breaks in a circular manner, sometimes leaving shreds on the pileus like some Amanitas. Atkinson has shown that in Amanita the volva of the same species may undergo the two different modes of breaking, and the same holds true of this form. Our plants did not show any shreds on the pileus, and the volva was angularly lobed. The pileus was not truly umbonate. It must not be confused with the gray form of *Amanitopsis vaginata.*

568. Volvaria umbonata Pk.

Torr. Bot. Club, Bull. 26, 1899.

"PILEUS 2-3 cm. broad, conico-campanulate or campanulate, then expanded and *furnished with a prominent umbo, white,* slightly viscid when moist, *silky when dry, strongly striate.* FLESH thin. GILLS free, remote, medium close, pale flesh color. STEM 5-6 cm. long, 4 mm. thick, *solid,* glabrous, white, slightly thickened below. VOLVA white, membranous, persistent, irregularly split into segments, forming a shallow cap. SPORES variable in size, broadly elliptical, nucleate, smooth, 5-7 x 4-5 micr.

"On lawns and grassy places."

The above is taken from Peck's and Lloyd's descriptions. Lloyd finds it in Ohio. It is probably to be found in our State if careful search be made.

569. Volvaria pubescentipes Pk.

N. Y. State Mus. Rep. 29, 1878 (*V. pubipes* in Sylloge).

Illustrations: Ibid., Pl. I, Fig. 1-3.

PILEUS 1-2 cm. broad, *dry, white,* obtuse, covered with adpressed, silky squamules, *not striate on margin.* GILLS free, remote, close, not very broad, white then flesh color, *edge persistently white-fimbriate.* STEM 2-4 cm. long, 1-2 mm. thick, usually slender, equal or subequal, *densely minutely villose* with spreading hairs, even, *white.* VOLVA white, membranous, subappressed, sometimes 3-lobed. SPORES suboval to broadly elliptical, smooth, 5-7 x 4-5 micr., pale flesh color.

(Dried: Buff to pale ochraceous-brown.)

Scattered. On the ground, among debris in hemlock and cedar swamps of northern Michigan, sparingly in frondose woods of the southern part. Marquette, Houghton, Bay View, New Richmond, Ann Arbor, etc. July-September. Frequent locally.

Slender, pure white, with minute hairs all over the stem. Its habitat in woods is a distinguishing character. Patouillard's figure of *V. plumulosus* Quel. of Europe (No. 333, Tab. Analyt.) is somewhat illustrative of our plant. I find the stem of *V. pubescentipes* of the woods always rather long and slender, and the cap and gills more narrow than in Patouillard's figure.

570. Volvaria hypopithys Fr.

Hymen. Europ., 1874.

PILEUS *conico*-campanulate, 6-15 mm. high, dry, *silky*, whitish, *even on margin*. FLESH thin. GILLS free, ascending, rather narrow, close, white then flesh-color, edge minutely crenulate. STEM 2-3 cm. long, 2-3 mm. thick, *solid*, equal, adpressed-silky, whitish. VOLVA vaginate, bilobed, tomentose externally, whitish. SPORES 5-7.5 x 3-4 micr., smooth, elliptical.

I have referred here a collection made by Messrs. Hill and Fischer of the Detroit Mycological Club, and given the description of their plant. It appears to lack the pubescent stem of the typical description, but its conical-shaped cap even at maturity seems to require its reference to this species or to a closely related one. The finders referred it to *V. murinella* because of the gray tinge of the pileus. Patouillard's figure, however, shows the pileus of that species expanded-plane and the plant smaller. Peck (in N. Y. State Bull. 54) reports *V. hypopithys* for New York, but without any notes. Our plant differs from *V. umbonata* Pk. in its pileus being even, not at all viscid, although the spores are the same. Further collections are necessary to determine its true place.

571. Volvaria pusilla Fr.

Syst. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 332 (as *V. parvula*).
Ricken, Blätterpilze, Pl. 70, Fig. 3.
Gillett, Champignons de France, No. 713 (as *V. parvula*).
Hard, Mushrooms, Fig. 195, p. 243, 1900.
Clements, Minn. Mushrooms, Fig. 31, p. 57, 1910.
Plate CI of this Report.

PILEUS 5-12 mm. broad, at first ovate then campanulate-convex, finally plane, *white*, silky-fibrillose, *dry*, even then rimose or striatu-

late on margin, obtuse or slightly depressed, rarely mammillate. FLESH thickish on disk only, white. GILLS free, close to subdistant, moderately broad, white then bright flesh color. STEM 1-2 cm. long, 1-3 mm. thick, white, equal, *glabrous, solid,* even. VOLVA split into 3 or 4 nearly equal lobes, firm, loose, white becoming sordid. SPORES elliptic-ovate, 6-8.5 x 4-5.5 micr., smooth, nucleate, incarnate in mass. CYSTIDIA scattered on sides and edge of gills, ventricose, very obtuse, 35-40 x 9-18 micr. ODOR none.

Solitary or scattered, under herbs in moist ground. Detroit, Ann Arbor. July-August. Rarely found.

This species is distinguished by its small size, white color, the regular, three to four-lobed volva and by its cystidia and spores. Dr. Fischer collected the Detroit specimens, from which Hard's figure was obtained; Dr. E. B. Mains found the Ann Arbor specimens of our photograph. It seems to be the same plant described by C. G. Lloyd in Mycological Notes, Vol. I, p. 9. Whether it is the true *V. pusilla* of Persoon remains an open question. Fries, in the Systema, does not mention the striations of the pileus, and in his later works includes the form under *V. parvula,* which he always describes with a dry cap. Ricken (Blätterpilze), however, says the cap is at first viscid, soon dry. Berkeley (Outlines) also speaks of the cap of *V. pusilla* as viscid and not striate. The stem is said to be somewhat stuffed to hollow, and hence our plant departs from Berkeley's also in this respect.

From the remarks of various authors it would seem that the species referred to *V. pusilla* by some and to *V. parvula* by others is an unusually variable plant, inasmuch as the pileus may be somewhat viscid or dry, even on the margin or striatulate, umbonate or plane, and the stem is either solid or with a narrow tubule. Careful study of the caps of our plants failed to reveal more than mere rudiments of a cuticle which could scarcely become viscid in wet weather. The stem was solid and practically homogeneous. There were no signs of striations on the pileus, although the expanded margin became slightly rivulose in age. The trama of the gills was convergent, composed of large, inflated cells. It remains for those who are lucky enough to find it often, to note to what extent it may vary as to the contested points.

Chamæota Smith, W. G.

(From the Greek, *chamai*, on the ground. The old generic name Annularia is pre-occupied.)

Pink-spored. Stem *fleshy, separable* from the pileus, with a persistent or evanescent *annulus*. Gills free. Spores rounded. Terrestrial or lignicolus. Fleshy, putrescent, *rare* mushrooms, corresponding to Lepiota of the white-spored group. They differ from Volvaria in having an annulus but no volva. The annulus is derived from an *inner veil*, which is thin. The annulus is usually movable. About a dozen species are known throughout the world. The two following species seem to be the only ones known in the United States, and their discovery is due to the careful and acute observations of Mr. Bronson Barlow of Greenville, and Dr. O. E. Fischer of the Detroit Mycological Club.

572. Chamæota mammillata (Longyear) Murrill

Mich. Acad. of Sci. Rep. 3, 1902. (As Annularia.)

Illustration: Ibid, Pl. I, Fig. 4.

PILEUS 1-2 cm. broad, plane at maturity *with a prominent mammiform umbo at the center*, whitish, umbo lemon-yellow, surface minutely rough. FLESH very thin, soft. GILLS free, ventricose, broad, thin, close, 3 mm. broad, pale flesh color. STEM 3.5 cm. long, 1.5 mm. thick at apex, gradually enlarging toward base, glabrous above and silky below the ring. ANNULUS membranous, persistent, white. SPORES subglobose, smooth, 5-6 micr. diam., pale flesh color. CYSTIDIA fusiform, inflated in the middle, 50 x 20 micr.

Solitary. On decaying logs in woods. Greenville. July. Rare. Reported by Longyear, collected by Mr. Barlow.

The type material is in the herbarium of Michigan Agricultural College, East Lansing.

573. Chamæota sphærospora (Pk.)

Torr. Bot. Club, Bull. 33, p. 216, 1906. (As Annularia.)

Illustrations: Plates VI, CII of this Report.

PILEUS 3-6 cm. broad, conic or subcampanulate, becoming expanded, umbonate, silky-fibrillose, yellow, fading to whitish in part, *umbo brownish*. FLESH thin. GILLS free, close, thin, whitish or cream-colored when young, flesh-color when mature, moderately broad, *edge white-fimbriate;* trama of parallel hyphae. STEM 3-8 cm. long, 4-8 mm. thick, equal or tapering upward, *solid,* fibrous, substriate, whitish. ANNULUS white, median or below the middle. SPORES globose or subglobose, 5-6 micr. diam., smooth, nonapiculate, dull flesh-color. BASIDIA 4-spored, at maturity projecting beyond the younger hymenium, about 25 x 8-9 micr. CYSTIDIA none, except on edge, which is densely covered by slender stalked long cells, enlarged at apex.

Subcaespitose. On rotten wood of elm trunk. Detroit. Collected by Dr. Fischer. August. Rare. Cotype in the University of Michigan herbarium.

Described by Dr. Peck from material collected near Detroit by O. E. Fischer. It has been suggested that it is identical with *C. fenzlii* Fr., illustrated as follows:

Kalchbrenner and Schulzer, Icones, Hymen Hung., Pl. 10, Fig. 1.

Gillet, Champignons de France, No. 30.

Engler and Prantl. I, 1** Fig. 121. B. p. 258.

In some respects it certainly has similar characters, but Gillet, who gives a full description, says the spores are "large" and his figures confirm this if we compare them with those in which he shows small spores of other species. Unfortunately neither Gillet nor any one else appears to have recorded the spore-measurements of *C. fenzlii*. Furthermore, the latter species is described as smaller, the annulus and stem yellow, or yellowish, the former evanescent. Gillet says the stem of *C. fenzlii* is at first solid then hollow. Further information concerning the variation of our plant is necessary before it can be reduced to synonymy. It seems to be a very rare plant and is only recorded from the one locality.

Pluteus Fr.

(From the Latin, *Pluteus,* a protective military covering.)

Pink-spored. *Without volva or annulus.* Stem *fleshy to fibrous,* not cartilaginous, separable from the pileus. Gills *free,* rounded behind, soft. Spores rounded, rarely angular. Hymenium *provided with cystidia.*

Small, soft mushrooms (except *P. cervinus* Fr. which is rather large), *lignicolous* for the most part, i. e., growing on wood, on logs, stumps, decayed wood, forest debris, or sawdust, rarely on manure. The smaller forms are found in very moist situations. *P. cervinus* is common; the others tend to be rare or infrequent.

The PILEUS may be glabrous, silky, velvety, minutely scaly or torn, fibrillose or granular; its surface is even, striate on the margin or varying to quite rugulose. The upper layer of hyphae is sometimes differentiated into a separable, somewhat viscid pellicle, or it is composed of loose, rounded cells of a different color; the shape, size and color of these surface hyphae or cells under the microscope provide a helpful means of definitely determining some of the species. The color of the pileus varies white, yellow, brown, blackish, or rarely orange to red. The GILLS are soft, not attached to the stem but rounded behind and often remote. Usually they are white, in a few cases yellowish, and all become tinged by the flesh-colored or rosy spores. They are coherent, i. e., collapsing on each other as in Coprinus, and often become moist and nearly deliquescent in wet weather. They are provided with large cells projecting beyond the basidia, either on their edge or sides or both, called CYSTIDIA; the shape and structure of the cystidia vary, and can be used with the spores to separate the otherwise often similar species. They are called STERILE CELLS when they occur on the edge of the gills, where they are sometimes arranged in clusters. The STEM is central, fleshy, often with a fibrous cuticle, not cartilaginous except under dry weather conditions; it is solid except in a few species, as e. g., *P. admirabilis* Pk. and *P. salicinus* Fr.; it is usually slender and fragile, equal, rarely subbulbous, glabrous or velvety, etc., like the pileus. The SPORES of the different species are very much alike, minute, subglobose or short-oblong, white and smooth, not angular in our species. They include a number of *edible* forms according to McIlvaine, although the older authors considered them with suspicion. Not all the species have been

tested, and all, except perhaps the edible *P. cervinus,* are too small to consider from a food-value standpoint.

The species can for the most part only be identified with the aid of a microscope, since the character of the cystidia must be known before certainty can prevail. Hence the following key is based on the only certain method which can be followed in this genus. Of the species not yet found in the State, *P. stercorarius* Pk. grows on manure heaps, and its spores are exceptionally large, measuring 12-15 micr. long; *P. sterilomarginatus* Pk. has angular spores. It is possible that *Pleurotus subpalmatus* Fr. which as it occurs with us is well illustrated by Cooke under *Pluteus phlebophorus,* Plate 422, B., has been reported as a Pluteus; its adnate gills, however, should prevent confusion.

Fries divided the genus into three sections, given below.

Key to the Species

(A) Pileus white or whitish. [See also (AA) and (AAA).]
  (a) Cystidia with 2-4 horns at apex; pileus subglabrous to fibrillose or rimose, 5-15 cm. broad. 574. *P. cervinus* Fr. var. *albus* Pk.
  (aa) Apex of cystidia without horns; pileus villose-tomentose, 2-7 cm. broad. 578. *P. tomentosulus* Pk.
  (aaa) Cystidia rare, not pronged; pileus glabrous, 2-3 cm. broad. 579. *P. roseocandidus* Atk.

(AA) Pileus yellow, orange or red.
  (a) Pileus orange to vermillion; spores short-oblong. 582. *P. caloceps* Atk.
  (aa) Pileus yellow, sometimes smoky tinged.
    (b) Pileus rugose-reticulate on disk.
      (c) Stem stuffed to hollow, yellow; pileus glabrous, umbonate. 584. *P. admirabilis* Pk.
      (cc) Stem solid, pinkish-white; pileus 4-5 cm. broad, smoky velvety on disk. *P. flavofuligineus* Atk.
    (bb) Pileus not rugose on disk, striate on margin; stem pellucid-white. 585. *P. leoninus* Fr.

(AAA) Pileus brown, fuscous, umber, blackish, etc.
  (a) Cystidia with 2-4 horns at apex; pileus not striate on margin; stem fibrillose.
    (b) Gills with their edges smoky-brown. 575. *P. umbrosus* Fr.
    (bb) Gills unicolorous.
      (c) Pileus usually rather large, 3-15 cm. broad; color dingy pale brown, but variable; common. 574. *P. cervinus* Fr.
      (cc) Pileus small to medium; pileus and base of stem tinged bluish or with a distinct olivaceous tinge; cystidia longer than in the preceding; rare. 576. *P. salicinus* Fr.
  (aa) Cystidia without horns at apex.
    (b) Pileus not truly striate on the margin.
      (c) Stem glabrous, pellucid, innately striatulate.
        (d) Stem and gills white at first. 581. *P. nanus* Fr.
        (dd) Stem and sometimes the gills, yellowish. 581. *P. nanus* var. *lutescens* Fr.
      (cc) Stem velvety to squamulose, brownish, etc.
        (d) Edge of gills of same color, cystidia hyaline. 580. *P. granularis* Pk.
        (dd) Edge of gills with yellowish cystidia. 580. *P. granularis* Pk. var. *umbrosellus* Atk.

(ccc) Stem silky, whitish or tinged fuscous; spores oblong, 6-6.5 x 3 micr. 577. *P. ephebius* Fr. var.

(bb) Pileus short- or long-striatulate on margin.

(c) Pileus slightly striate on margin, glabrous, cinnamon-brown. *P. chrysophaeus* Fr.

(cc) Pileus long-striate on margin, minutely velvety or obscurely granulose.

(d) Pileus 1-3 cm. broad; stem fibrous-striate, glabrous, white or brownish. (See 617. *Leptonia seticeps* Atk.)

(dd) Pileus 2.5-5 cm. broad; stem innately striatulate, glabrous. 583. *P. longistriatus* Pk.

Section I. Surface of the pileus at length fibrillose or floccose, by the breaking up of the horizontal layer of the fibrils of the cuticle.

574. Pluteus cervinus Fr. (Edible)

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 301.
Patouillard, Tab. Analyt., No. 335.
Ricken, Blätterpilze, Pl. 71, Fig. 1.
Atkinson, Mushrooms, Fig. 132, p. 138, 1900.
Hard, Mushrooms, Fig. 188, 189, p. 235, 1908.
Marshall, Mushroom Book, op. p. 87, 1905.
N. Y. State Mus. Rep. 54, Pl. 74, 1901.
McIlvaine, American Mushrooms, Pl. LXI, p. 243.
Plate CIII of this Report.

PILEUS 5-10 cm. broad, rarely smaller, campanulate, then broadly convex to expanded, *varying glabrous to fibrillose,* fibrils darker, disk sometimes scaly, even on margin, white, dingy-tan, grayish brown or darker, provided with a somewhat separable, sometimes subviscid, pellicle; FLESH white. GILLS close, free, broad, rounded behind, white then flesh-colored from the spores. STEM equal or slightly tapering upward, 5-15 cm. long, 6-18 mm. thick, firm, solid, dingy white to brownish-tan, glabrous or somewhat fibrillose. SPORES inconstant in size and shape, *short-oblong, oval,* broadly elliptical, 5-8 x 4-5 micr., sometimes longer or broader, more rarely globular, often nucleate, smooth, flesh-colored in mass. CYSTIDIA abundant, fusoid, stout, terminating in 2-4 short, blunt horns. ODOR and TASTE somewhat disagreeable.

Solitary, scattered, or when growing on sawdust, etc., often caespitose. On stumps, logs, from underground roots or wood, on boards, sawdust, etc. Throughout the State, mostly in broad-leaved

woods. June to October (earliest record is May 28; latest, October 4). Very common. Edible.

Like *Armillaria mellea* its frequent fruiting makes it possible to find a great amount of variation, and many varieties have been named. Var. *alba*. Pk. is whitish, often caespitose and frequents sawdust piles. Var. *viscosus* Lloyd is described as very viscid on the cap, and with narrow gills. Var. *petasatus* Fr. has the cap striate to the middle. It is probable that all of these forms intergrade with the typical plant which along with the varieties varies into many shades of color. Slender forms occur in low woods, on debris, with the stature of *P. leoninus,* but the pileus is almost white.

This species can be distinguished from Entoloma by its free gills and its lignicolous habitat, although of similar appearance otherwise. As Entoloma contains poisonous species, this is important. In Europe, *P. cervinus* has been marked as "suspected"; in this country, however, it is highly praised by mycophagists, since the disagreeable odor and taste disappear on cooking. It has a characteristic relation to the stump on which it is often found, in being so attached that it is difficult to get a piece of the wood and mushroom together, since its stem grows in the vertical cracks of the stump. With us it is found on wood, rarely on soil, although the condition of the woody substratum varies exceedingly. Small plants imitate some of the other species and can only be separated with certainty by the use of the microscope. The pronged cystidia are usually the decisive character. Patouillard says that the flesh has yellowish lactiferous hyphae scattered throughout it.

575. Pluteus umbrosus Fr.

Sys. Mycol., 1821.

Illustrations: Bresadola, Fung. Trid., Vol. 2, Pl. 116.
Ricken, Blätterpilze, Pl. 70, Fig. 4.

PILEUS 5-10 cm. broad, campanulate then convex-expanded, broadly umbonate, *smoky umber* or blackish brown, *rugose-reticulate and floccose-scaly on disk*, even and fibrillose on margin. FLESH white. Gills free, close, broad, ventricose, whitish then flesh-colored from the spores, *edge fimbriate and smoky brown* from the dark cystidia. STEM 3-8 cm. long, 4-8 mm. thick, solid, firm, equal or slightly tapering upward, dingy white to brownish, covered with smoky-brown fibrills. SPORES oval-elliptical, 5-7 x 3-4 micr.,

smooth, flesh color in mass. CYSTIDIA fusoid, 75-85 x 15-20 micr., apex with 2-4 horns. ODOR and TASTE slightly disagreeable.

Solitary or scattered on rotten wood, in conifer woods, usually on hemlock or pine. Huron Mountains, Houghton, New Richmond. August and September. Infrequent except locally.

Distinguished at once by the smoky-brown edge of the gills. It tends to be smaller than *P. cervinus* and darker in color. *P. granularis* var. *umbrosellus* has yellowish edged gills, and its cystidia are not horned. There seem to be a number of varieties connecting *P. cervinus* and *P. umbrosus*. McIlvaine pronounces it edible.

576. Pluteus salicinus Fr. var.

Syst. Mycol., 1821 (as *Leptonia salicinus*).

Illustration: Cooke, Ill., Pl. 1169.

PILEUS 2-5 cm. broad, convex to expanded, broadly umbonate, smoky-umber, pruinose-velvety, disk flocculose, margin even. GILLS free, close, not broad, reaching margin of cap, *edge concolor,* white then flesh-colored from the spores. STEM equal, 2-4 cm. long, 2-4 mm. thick, base bulbillose, curved, shining, silky-fibrillose, stuffed, whitish but covered with smoky fibrils, *base smoky-olive.* SPORES broadly elliptical, 7.5-8.5 x 5-6 micr., smooth, flesh color. CYSTIDIA 2-4 pronged at apex, 75-90 x 15-17 micr., fuscoid, stout.

Solitary. On rotten wood, in willow and alder swamp. July-August. Ann Arbor. Rare.

The green tinge is not very marked on the pileus but is quite marked at the base of the stem. It agrees best with Massee's description (British Fungus Flora). The typical bluish form has not been seen by me in the State, although collected elsewhere. The horned cystidia separate it from other smoky-umber species, and the white edge of the gills distinguishes it from *P. umbrosus.*

577. Pluteus ephebius Fr. var.

Syst. Mycol., 1821.

Illustration: Cooke, Ill., Pl. 517.

PILEUS 2.5 cm. broad, convex-expanded, *delicately silky-fibrillose,* shining, becoming somewhat fibrillose-scaly, not at all granular, *mouse-gray,* unicolorous, even on margin. GILLS free, rather

remote, not broad, pruinose, white then bright pink from spores, edge concolor. STEM about 2 cm. long, equal, curved, silky, white or tinged fuscous, *striate.* SPORES *oblong,* 6-6.5 x 3 micr., smooth, pink. CYSTIDIA about 50 micr. long, slender, sometimes curved and rounded at the apex, abundant on sides and edge of gills.

Solitary. On rotten logs, in woods. New Richmond. Rare.

The fibrillose pileus allies this form with this section. The oblong spores, characteristic of the species according to Massee, induced me to place it here although the absence of "bluish down" which Fries italicises may indicate that it is a different or undescribed species. It seems to be close to var. *drepanophyllus* Schultz, the status of which is uncertain.

578. Pluteus tomentosulus Pk.

N. Y. State Mus. Rep. 32, 1879.

Illustration: Atkinson, Mushrooms, Fig. 133, p. 139, 1900.

PILEUS 3-7 cm. broad, thin, soon expanded, obtuse, umbonate, *floccose-tomentose,* more densely so on disk, *white* or tinged with pink, especially on the margin, margin even. FLESH thin, white. GILLS free, rather remote, crowded, *broad,* white then rose-colored from the spores, edge fimbriate. STEM 5-10 cm. long, 4-8 mm. thick, equal, solid, fibrillose-*striate,* subbulbous at base, slightly tomentulose, bulb tomentose, white. SPORES subglobose, or broadly short elliptical, 5-7 x 4.5-5.5 micr., smooth, rose-flesh color in mass. CYSTIDIA stout, 85-95 x 22-25 micr., not horned, bottle-shaped on a rather slender stalk, scattered, more numerous on edge of gills.

Solitary or scattered. On rotten logs or prostrate trunks, especially in hemlock, tamarack or cedar swamps. Throughout the State: Marquette, Houghton, Sault Ste. Marie, New Richmond, Ann Arbor. July, August, September. Frequent in the northern part of State.

This is a beautiful species but prefers deep swamps. In Europe *P. pellitus* Fr., a more glabrous species, takes its place. According to Peck, the pileus often has a pink tinge.

579. Pluteus roseocandidus Atk.

Ann. Mycol., Vol. VII, p. 373, 1909.

PILEUS 2-3 cm. broad, *fragile,* convex then expanded, glabrous, dry, *pure white,* sometimes tinged rose or brownish-buff in wet weather, *striatulate on the thin margin,* with a dull lustre. FLESH thin, white. GILLS free, reaching the stem, elliptical, close, rounded behind, moderately broad, hyphae of trama converging, white at first then pink. STEM 3-4 cm. long, 2.5-4 mm. thick, equal, even, hollow, glabrous, slightly mealy at apex, *fragile,* terete or compressed, subbulbillate, innately fibrillose, *pure white.* SPORES globose, smooth, 6-8 micr., pale diam., flesh color under microscope. CYSTIDIA few or lacking on sides of gills. *Sterile cells* on edge, globose or ventricose-inflated, obtuse, 50-80 x 20-35 micr. *Basidia* 30 x 8-9 micr., 14-spored. ODOR none.

Gregariôus. On grassy ground in woods near tamarack swamp. Ann Arbor. October. Rare.

This white species is said to have a two-layered trama in the pileus, the inner floccose, the outer forming a cuticle two to three cells thick of pyriform to subglobose cells. I have found it but once.

Section II. Surface of pileus granulose, pruinate or pulverulent, composed of enlarged globular pyriform or fusoid-elongated, colored cells.

580. Pluteus granularis Pk.

Buffalo Soc. Nat. Sci., Bull. 1, 1873.

Illustration: Hard, Mushrooms, Fig. 190, p. 237.

PILEUS 2-5 cm. broad, convex to plane, subumbonate, *rugose-wrinkled,* yellowish-brown to umber, or chestnut color, *granulose* or *villose-granulose* like plush. GILLS free, crowded, rather broad, ventricose, white then flesh-colored from spores, *edge concolor.* STEM 3-7 cm. long, 2-4 mm. thick, slender, equal, solid, pallid, *velvety pubescent* or covered with brown scales towards base. SPORES globose, 4-5 micr. diam., apiculate, nucleate, smooth, flesh color. CYSTIDIA globose-obovate, about 35-25 micr., infrequent, hyaline.

Solitary or scattered. On rotten logs, etc., in conifer and frondose woods.

Throughout the State: Houghton, Huron Mountains, Marquette, Bay View, Ann Arbor. July-September. More frequent in mixed hemlock woods; never common.

The villosity and granulosity on the cap, when present, is due to globular or elongated-fusoid cells, filled with coloring matter. These cells correspond to the fibrils of such species as *P. umbrosus,* from which this species is separated by the spherical spores and cystidia without prongs at the apex. Peck describes the spores in the 26th report as spherical, later, in the 38th report, he says "broadly elliptical, 6-7.5 x 5-6 micr." Our plants, like Lloyd's (Mycol. Notes, 2), have spherical spores.

Var. *umbrosellus* Atk. nov. var. is distinguished by the more villose pileus and the tinge of *yellow on the edge of the gills.* The villosity is caused by long, yellowish brown cells, 200-300 micr. long, 20-30 micr. wide, often crowded into erect, pointed scales, arranged in sooty, radiating or reticulate, velvety ridges. The edges of the gills are provided with sterile cells filled with a pale yellow coloring matter. The cystidia are scattered, globose or pyriform, not pronged. The spores are 4-5 x 3-4 micr., longer than broad, subglobose, similar to those of *P. umbrosus;* the cystidia, however, separate it from the latter.

Var. *intermedius* nov. var. approaches *Leptonia seticeps* in size of spores, and white-fimbriate edge of gills; but the stem is stuffed, then hollow, and 4-5 cm. long, 4-5 mm. thick. The cap is ruglose-villose and 2-5 cm. broad.

Solitary or scattered. On rotten wood. Detroit, etc. Infrequent.

581. Pluteus nanus Fr.

Syst. Mycol., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 334.
Ricken, Blätterpilze, Pl. 70, Fig. 6.

PILEUS 2-3 cm. broad, convex then expanded, obtuse, *radiately rugose on disk,* margin even or nearly so, *velvety-pruinose,* granulose or *pulverulent, brownish ashy,* umber or darker when young. GILLS free, close, ventricose, narrowed toward ends, white then flesh color from spores, edge fimbriate. STEM 2-3 cm. long, 2-3 mm. thick, *solid,* equal, rigid often curved, *glabrous,* pellucid-white,

striatulate or innately fibrillose. SPORES *subglobose,* 4-5.5 micr. diam., smooth, flesh color. CYSTIDIA fusiform bottle-shaped, sometimes tapering to a point at apex, not horned, *vaculoate,* 75-80 micr. long, on the sides and edge of the gills.

Solitary or scattered. On decaying logs, sticks, etc., in low woods and swamps. June to October. Throughout the State: Huron Mountains, New Richmond, Ann Arbor. Infrequent.

The velvety character of the pileus is only apparent since the surface under a lens is granulose or pulverulent; this is due to globular or fusoid cells which compose the surface layer and give it the brown appearance. It is separated from a number of others by the glabrous stem, small size and subglobose spores. It may appear quite early. There is sometimes a smoky tinge on the cap.

Var. *lutescens* Fr. *Stem* and sometimes the *gills* are *yellow.* The spores seem to be more truly spherical in the variety; stem *solid,* striate.

Habitat, etc., as in the type: New Richmond, Ann Arbor. Infrequent.

582. Pluteus caloceps Atk.

Ann. Mycol., 1909.

"PILEUS 2.5-4.5 cm. broad, convex, umbonate, orpiment-orange to vermillion, orange-vermillion on center, glabrous or slightly granular by separation of the cells, or somewhat rimose on margin; trama two-layered, outer layer composed of globose cells. FLESH white. GILLS free, rounded behind, broadly elliptical to subventricose, pale dull flesh color, edge flocculose, tramal hyphae converging. STEM 3-6 cm. long, 3-5 mm. thick, pallid, fibrous-striate. SPORES suboblong, 5-8 x 4-6 micr. CYSTIDIA ventricose on sides of gills, clavate to subfusoid on edge, 60-75 x 12-20 micr."

Solitary. On rotten wood and on the ground. Ann Arbor. Rare.

583. Pluteus longistriatus Pk.

N. Y. State Mus. Rep. 30, 1878.

Illustration: Plate CIV of this Report.

PILEUS 2-5 cm. broad, very thin, convex then expanded, pale brownish-gray to *brownish-ashy,* minutely scaly on disk and cuticle at length breaking into minute granules, *long-striate or*

subsulcate when old. GILLS free, close, *rather broad,* width almost uniform, rounded behind, white then pale flesh color from spores, edge pulverulent. STEM 3-5 cm. long, 2-3.5 mm. thick, equal, *solid,* fibrous, innately striatulate, *white,* pulverulent. SPORES subglobose, 6-7 x 5 micr., slightly longer than wide, granular within, smooth, *pale* flesh color. CYSTIDIA ventricose, cylindrical in upper part, 75-90 micr. long, not horned, apex broadly obtuse to pointed.

Solitary. On rotten wood in moist places. Ann Arbor, South Haven. June-July. Infrequent.

Peck describes the stem glabrous; our plants had a distinctly pulverulent stem when fresh. The spores also did not seem to be dented on one side as indicated by Peck. Nevertheless, the description fits closely in other respects. It differs from *P. chrysophaeus* in the long striations of the pileus and the fibrous-solid stem; the color, also, is not cinnamon. In age, the longitudinal fibres within the stem loosen, so that it appears falsely fistulose. The larger size and truly free gills separate it from *Leptonia seticeps,* which is long-striatulate on cap.

Section III. Surface of pileus glabrous; moist or hygrophanous.

584. Pluteus admirabilis Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 1-2 cm. broad, thin, convex-campanulate then expanded, usually umbonate, *glabrous,* hygrophanous, *rugose-reticulate, ochre-yellow to luteous,* brownish when young, striatulate on margin when moist, subeven when dry. GILLS free, rounded behind, moderately broad, ventricose, close, whitish or yellowish then rosy-flesh color from the spores. STEM 3-5 cm. long, 1-2 mm. thick, slender, equal, subrigid, glabrous, *stuffed then hollow, yellow,* white-myceloid at base. SPORES subglobose, 5.5-7 x 5-6 micr., smooth, rosy flesh color in mass. CYSTIDIA ventricose, cylindrical in upper part, rounded at apex, 55-65 x 18 micr., scattered, more abundant in the interspaces, more ovoid on the edge of the gills.

Scattered or subgregarious. On logs and decayed wood, in mixed conifer or frondose woods. Houghton, Munising, Marquette, New Richmond, Ann Arbor. July, August and September. More frequent in hemlock woods of the northern part of the State.

The surface of the pileus is composed of spheroid stalked cells

containing the yellow coloring matter; these are 30-35 x 20-25 micr. in diam. The hyphae of the gill-trama converge and are long and cylindrical. From *P. leoninus* this form is separated by its yellow stem and rugulose pileus; the rugosity, however, may be almost lacking at times. Variations occur approaching other species, like *P. chrysophaeus, P. flavafuligineus* and *P. leoninus,* and such are often difficult to place. I have never seen *P. chrysophaeus* Fr. but include it in the key, as it has been reported by Longyear.

585. Pluteus leoninus Fr.

Syst. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 639.
Ricken, Blätterpilze, Pl. 71, Fig. 5.
Gillett, Champignons de France.

PILEUS 2-5 cm. broad, campanulate-convex, subumbonate, *not rugulose,* glabrous, moist, *yellow,* striate on margin, GILLS free, moderately broad, close, white then deep flesh color. STEM 5-7 cm. long, 2-5 mm. thick, equal or enlarged below, striatulate, glabrous, *solid,* pellucid-white or whitish. SPORES subglobose to oval elliptical, 6-7 x 5 micr., smooth, dull *rose-colored.* CYSTIDIA about 60 micr. long, fusiform, subacuminate above, not abundant, not horned.

Solitary. On rotten wood. Infrequent in the hemlock forests of the north. Negaunee, etc.

A form was found with the surface of the pileus minutely velvety. Patouillard says the surface is glabrous, composed of long slender hyphae. In this respect the form differs markedly from *P. admirabilis* Pk.

Entoloma Fr.

(From the Greek, *entos,* inside; and *loma,* the border of a robe.)

Pink-spored. Without volva or annulus. Stem *fleshy or fibrous,* not cartilaginous, soft, *confluent with the pileus.* Gills *adnate or adnexed, emarginate* or sinuate. Spores *angular,* rarely rounded. Cystidia rarely present in a few species.

Mostly large, soft, putrescent mushrooms; *terrestrial,* frequent in rainy weather; some of the species are *poisonous.* A difficult genus to study.

The PILEUS may be glabrous, pruinose, silky or fibrillose, hardly ever strongly scaly; it is either hygrophanous, viscid or dry, in the last case fibrillose or somewhat scaly. The cuticle varies in structure, the viscid species being provided with a pellicle composed of gelatinous hyphae while in many cases the surface has a gelatinous feel but is not truly differentiated and does not become viscid except in very prolonged wet weather. In one section the surface is distinctly fibrillose, the fibrils sometimes forming definite scales on the disk. In only a few species is the margin striate or striatulate. Many become water-soaked in rainy weather, and it is then often difficult to determine whether they are hygrophanous. The colors vary from white, watery-whitish, grayish, grayish-brown to dark brown; more rarely tinged violet, reddish or yellowish and always with only the soft shades of these colors. The colors are hard to describe in terms which are sufficiently clear, and this has caused considerable confusion; hence other characters must be used as much as possible. Nearly all the species are somewhat fragile, but may become tougher in dry weather.

The GILLS are adnate-sinuate as in Tricholoma, sometimes adnexed, often seceding from the stem in age. It is important to note their color before they become pink from the spores; this is either *white, yellowish* or *ashy*. They are rather broad, even in the small species rarely narrow. In distinction from Pluteus, there are no cystidia except in a very few species, the edge is therefore usually entire. The STEM is central, fleshy or with the outer rind fibrous and spongy within, sometimes loosely stuffed and then hollow, not cartilaginous except under peculiar weather conditions. In the larger species the stem is stout as in Tricholoma. It is intimately connected with the pileus, the trama of the stem extending unaltered into that of the pileus as in all the genera with adnate gills; it is therefore not separable as in Pluteus and Volvaria.

The SPORES are *irregularly-angular*, the general outline varying from spherical to elliptical, often with a prominent, oblique apiculus at the angle where it was attached to the basidium; a few species have rounded spores, i. e., not angled. Their color in mass varies from pale to deep flesh color, to rosy or salmon. *Tricholoma personatum* Fr., *Tricholoma nudum* Fr. and *Tricholoma panoeolum* var. *caespitosa* Bres. have flesh-colored spores in mass and will be looked for here.

A number of the species are known to be very *poisonous; E. lividum* Fr. has been proved so by both Romell and Worthington Smith; *E. grande* Pk. is suspected by its author. The species are

difficult for the amateur and even for the expert, and hence it is necessary to proceed with extreme caution when collecting for the table. *It is best not to eat Entolomas at all* because of the danger of confusing the species. The common saying, "only the mushroom which is pink underneath the cap is sure to be safe," illustrates another error in so-called "rules to know mushrooms," since here we have a whole genus which the unsuspecting amateur who is told the above, would be likely to take for *Agaricus compestris.*

This genus corresponds, by its sinuate-adnate gills, its fleshy-fibrous stem, and lack of volva and annulus, to *Tricholoma* of the white-spored group and to *Hebeloma* of the pink-spored group. Peck reports 23 species in New York; we have been able to identify 18 species of those that have been found in Michigan. Others have been collected within our limits but need further study. Some occur seldom; others are more common, especially in showery weather. To what extent certain species are limited to the conifer regions of the State has not yet been determined.

Fries divided the genus into three sections: Genuini, Leptonidei and Nolandei. To these Peck has added a fourth section of American species, which he calls Conoidei.

Key to the Species

(A) Pileus scaly, scabrous, flocculose or superficially silky-fibrillose.
  (a) Pileus white, 5-15 mm. broad, silky, spores 9-12 x 7-8 micr. 588. *E. sericellum* Fr.
  (aa) Pileus not white, 1-5 cm. broad.
    (b) Pileus scabrous, dark brown, 1-3 cm. broad; stem slender. 587. *E. scabrinellum* Pk.
    (bb) Pileus not scabrous.
      (c) Pileus and stem tinged purplish or wine color; stem solid. 589. *E. cyaneum* Pk. (cf. also *E. jubatum* Fr.)
      (cc) Pileus and stem not tinged purplish.
        (d) Gills ashy or smoky at first; pileus mouse-gray; stem hollow. 590. *E. jubatum* Fr.
        (dd) Gills white at first; pileus ashy or ashy-brown. 601. *E. peckianum* Burt.

(AA) Pileus glabrous, moist, hygrophanous or viscid.
  (a) Pileus pelliculose or the surface viscid, gelatinous.
    (b) Pileus 2-5 cm., gelatinous above, flesh color, coarsely reticulate; stem eccentric; rare. (See 699. *Pleurotus subpalmatus.*)
    (bb) Pileus not reticulated.
      (c) Stem loosely stuffed then hollow, stout; pileus livid-brownish (moist), 7-10 cm. broad. 586. *E. lividum* Fr.
      (cc) Stem longer, solid; pileus viscid, smaller, grayish. *E. prunuloides* Fr.
  (aa) Pileus not viscid.
    (b) Pileus hygrophanous.
      (c) Odor and taste farinaceous, at least when plants are fresh and crushed.
        (d) Gills gray at first; pileus dark brown, 2-5 cm. broad, striatulate (moist). 596. *E. sericeum* Fr.
        (dd) Gills white or pallid at first.

(e) Pileus conic-campanulate or umbonate, streaked with darker fibrils; stem short. 591. *E. clypeatum* Fr.
(ee) Pileus convex or finally plane, subumbonate, grayish-brown (moist).
(f) Stem at length tinged gray; pileus scarcely fading, with a delicate, separable pellicle. 595. *E. griseum* Pk.
(ff) Stem white; pileus fading to whitish; gills narrow. 594. *E. scricatum* Britz.
(cc) Odor and taste not farinaceous.
(d) Odor of fresh plant nitrous. 593. *E. nidorosum* Fr.
(dd) Odor not nitrous.
(e) Pileus umber, fuscous or cinnamon (moist).
(f) Pileus conic-campanulate or umbonate; stem twisted; spores elongated-angular. 597. *E. strictius* Pk.
(ff) Pileus at length plane; stem pure white; gills rather broad; spores globose-angular. 592. *E. rhodopolium* Fr.
(ee) Pileus whitish or yellow-tinged (moist).
(f) Stout and firm, pileus watery, whitish or tinged yellowish, 5-12 cm. broad; stem 10-20 mm. thick. 598. *E. grayanum* Pk.
(ff) Rather slender and fragile, pileus whitish, 2-6 cm. broad; stem 3-8 mm. thick. 599. *E. speculum* Fr.
(bb) Pileus neither viscid nor hygrophanous.
(c) Pileus conic or campanulate, usually unexpanded, 1-5 cm. broad; among moss, especially sphagnum.
(d) Color of pileus changing darker in age, from pale yellow to reddish-brown. *E. variabile* Pk.
(dd) Pileus fading or scarcely changing.
(e) Spores quadrate, 4-angled.
(f) Pileus strongly cuspidate at apex, pale yellow. 602. *E. cuspidatum* Pk.
(ff) Pileus not cuspidate.
(g) Pileus yellow, smoky-yellow, or greenish-yellow. *E. luteum* Pk.
(gg) Pileus salmon-colored, subacute at apex. 600. *E. salmoneum* Pk.
(ee) Spores 5-6 sided, irregular, longer than wide; pileus gray to smoky-brown, umbonate. 601. *E. peckianum* Bert.
(cc) Pileus convex-expanded, large, yellowish-white or tinged brownish; gills broad; stem solid; spores angular-sphoeroid, 8-10 micr. *E. grande* Pk.

Section I. Genuini. Pileus fleshy, glabrous, moist or viscid; not hygrophanous.

586. Entoloma lividum Fr. (Poisonous)

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 311.
Ricken, Blätterpilze, Pl. 72, Fig. 2.
Gillet, Champignons de France, No. 271.

PILEUS 7-10 cm. broad, campanulate then expanded, *glabrous, pelliculose,* the cuticle composed of subgelatinous hyphae about 6

micr. diam., splitting into fibrillose parts on drying, viscid in very wet weather, *pale livid-tan* faded when dry, repand, wrinkled-rugose, margin striate. GILLS *adnexed,* abruptly rounded behind, broad, subventricose, subdistant at stem, pallid then bright flesh color. Stem 6-8 cm. long, 1.5-2.5 cm. thick, stout, *white, glabrous,* apex subpruinose, even, subequal, *stuffed then hollow.* SPORES sphoeroid-angular, 8-10 micr. diam., *bright flesh color in mass,* apiculus prominent, 5-6 angled. CYSTIDIA none or very few, fusoid. ODOR faint. TASTE strongly farinaceous.

Gregarious. On the ground in white pine and beech woods of western Michigan. New Richmond. September. Rare. *Poisonous.*

This rare Entoloma is a rather stout plant. Its pileus is viscid in wet weather, although the descriptions merely call it "pelliculose," so that it is identified with difficulty when one follows the European authors. A specimen from Sweden, which was referred to *E. lividum* by Romell, agrees with our specimens in having subgelatinous thick hyphae in the cuticle, and when dried has the appearance of a surface once viscid or subviscid like that of our plant. Furthermore *E. lividum* is described with a stuffed to hollow stem, while its near relatives *E. sinuatum* and *E. prunuloides* have solid stems. If Gillet's and Cooke's figures of the latter are correct, then I have never collected such Entolomas with a viscid cuticle on the pileus. Romell told me he tested the edibility of *E. lividum* with serious consequences, and hence he ought to know the plant. It seems to be rare and will on that account cause little damage. The gills are often tinged yellowish and the pileus may have a livid-brown color. *E. prunuloides* Fr. is said to have an umbonate ashy cap, sometimes tinged yellowish, considerably smaller according to Cooke's, Gillet's and Patouillard's figures, and the stem is slightly striate and solid. It is said to be viscid.

Section II. Leptonidei. Pileus campanulate-expanded or convex-plane, dry, flocculose or subsquamose; not hygrophanous.

587. Entoloma scabrinellum Pk.

N. Y. State Mus. Rep. 33, 1880.

PILEUS 1-3 cm. broad, broadly convex, expanded and subumbonate, dry, scabrous, densely covered by minute, erect, spine-like

scales, *dark mouse-brown or smoky-brown,* the thin incurved margin slightly surpassing the gills. FLESH thin, pallid or tinged brown. GILLS adnexed, rounded behind, becoming deeply emarginate, *broad,* ventricose, at first grayish-white, becoming pink, edge white-flocculose. STEM 3-8 cm. long, 2-3 mm. thick, tapering upward, thicker at base, stuffed then hollow, fibrillose, glabrescent, scurfy-pruinose at apex, white-mycelioid at base, pallid or tinged brownish. SPORES coarsely tuberculate-angular, elliptic in outline, 7-10 x 5.5-6.5 micr., flesh-pink. CYSTIDIA none. *Sterile cells* on edge of gills, capitate, nine-pin shaped. BASIDIA 40 x 9 micr., 4-spored. ODOR none.

Gregarious. On the ground, low mossy woods of pine, beech, etc. New Richmond. September. Rare.

It seems to be nearest to *E. scabrosa* Fr., but it does not possess an umbilicate pileus, the apex of the stem is not black-punctate and the gills are not segmentoid. Our plants were somewhat larger and darker than those found by Peck.

588. Entoloma sericellum Fr.

Syst. Mycol., 1821.

Illustrations: Fries, Icones, Pl. 95, Fig. 3.
Ricken, Blätterpilze, Pl. 73, Fig. 4 (as *Leptonia sericellum*).
Cooke, Ill., Pl. 307.

PILEUS 5-15 mm. broad, convex then plane, small, pure *shining* white, or pellucid-white, *silky* or minutely squamulose, even on margin which is incurved at first. GILLS broadly adnate, becoming sinuate, slightly decurrent by a tooth, rather *distant and broad,* white then bright flesh color from the spores. STEM 2-5 cm. long, 1-2 mm. thick, *slender,* pellucid shining white, stuffed then hollow, equal, even, pruinose at apex, glabrous, soft, or slightly toughish and fibrous. SPORES elongated, angular-tuberculate, 9-13 x 6-8 micr., variable in size, apiculus prominent, bright flesh color in mass.

(Dried: Stem pale rufous; pileus pale brownish-buff, tinged rufous.)

Scattered. On debris or humus in low frondose woods, cedar or hemlock swamps, etc. August-September. Throughout the State, Ann Arbor, Bay View, Marquette, Houghton. Frequent.

The color sometimes varies to a creamy tint. The pileus may be obtuse or depressed. It has the stature of an Eccilia, and the de-

pressed pileus and subcartilaginous stem remind one of a Leptonia. It is smaller than *E. speculum* and has very different spores.

589. Entoloma cyaneum Pk.

Buffalo Soc. Nat. Sci., Bull. 1, 1873.

PILEUS 2-3.5 cm. broad, *umbonate,* convex-campanulate, dry, *fibrillose-squamulose,* dark vinaceous-murinus (Sacc.), paler at length, margin even. FLESH white, thin except disk. GILLS *adnate,* later seceding, close, rather broad, at first white-tinged vinaceous then flesh color tinged ashy, *edge white-fimbriate.* STEM 3-6 cm. long, 2-4 mm. thick, equal or subequal, *solid,* fibrillose-striate, *furfuraceous-squamulose* especially upwards, twisted at times, vinaceous above, pallid below, white and fibrous-fleshy within, cuticle subcartilaginous. SPORES angular-tuberculate, subelliptical in outline, 7-9 x 4.5-6 micr., flesh color in mass. CYSTIDIA few on sides of gills, ventricose; sterile cells numerous on the edge and nine-pin shaped.

(Dried: Pileus dark amber-brown.)

Solitary or scattered. Sandy soil and humus, in birch and hemlock swamps of our coniferous regions. August and September. Marquette, Negaunee, New Richmond. Infrequent or rare.

It has the habit of a Leptonia, and might be mistaken for one. Peck describes the stem as hollow; our specimens invariably had the interior filled with a solid fibrous-fleshy substance; this sometimes loosens longitudinally so as to give a false "hollow" interior. It has much the appearance of *E. jubatum* Fr. as illustrated by Cooke, and of *E. griseo-cyaneum* Fr. as figured by Fries (Icones, Plate 94, Fig. 1). It differs from both these in its solid stem and in the color of the pileus. It is said to occur sometimes on decaying wood or mossy logs.

590. Entoloma jubatum Fr.

Syst. Mycol., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 136, 1900.
Cooke, Ill., Pl. 317.
Fries, Icones, Pl. 92, Fig. 1.

"PILEUS 2-5 cm. broad, *mouse color,* dry, campanulate then expanded umbonate, *rillose-scaly or fibrillose.* GILLS *slightly ad-*

nexed, seceding, ventricose, *crowded, at first dark fuligineous,* then *purple fuligineous.* STEM 5-8 cm. long, 4-6 mm. thick, fleshy-fibrous, rigid, fragile, *hollow,* equal, becoming fuscous and clothed with fuligineous fibrils. SPORES extremely irregular, 9-12 x 6-7 micr., (Ricken). Inodorous."

In woods. East Lansing. Reported by Longyear.

The description is taken from Fries' Hymenomycetes Europei and Stevenson's British Fungi. Atkinson has described a form with a dull heliotrope-purple pileus and stem, with spores 7-11 x 6-7 micr., irregularly oval, coarsely angular, nucleate and 5-7 angled. This species differs from *E. cyaneum* in the hollow stem, adnexed, almost free gills and larger spores. It is rare in Michigan.

Section III. Nolanidei. Pileus thin, *hygrophanous,* somewhat silky when dry, often wavy and irregular.

591. Entoloma clypeatum Fr. (Edible)

Epicrisis, 1836.

Illustrations; Cooke, Ill., Pl. 319.
Gillet, Champignons de France, No. 270.
Ricken, Blätterpilze, Pl. 73, Fig. 1.
Peck, N. Y. State Mus. Rep. 53, Plate D. (As *E. strictius* var. *irregulare.*)

PILEUS 3-10 cm. broad, *campanulate,* with an obtusely conic umbo, hygrophanous, lurid-brown (moist), *brownish-ashy* (dry), often *virgate* with darker lines, glabrous, margin even, often wavy. FLESH thin, white. GILLS adnexed, *rounded behind,* seceding, sometimes emarginate with decurrent tooth, moderately broad, subdistant to close, whitish then sordid rose-colored, *edge serrate-eroded.* STEM 4-6 cm. long, 6-12 mm. thick, often rather stout, and short, stuffed or hollow, sometimes compressed, fragile, silky-fibrillose, white or whitish, apex subpruinose, often rivulose. SPORES subglobose, angular, 7-9.5 x 6-7.5 micr., rosy in mass. Taste and odor *farinaceous.*

(Dried: Pileus ashy-brown, gills rose-colored.)

Gregarious to subcaespitose. On the ground in low woods, maple, elm, beech, etc., sometimes in grassy places near woods. Ann Arbor, New Richmond. July to September. Infrequent.

Usually known when dry by the grayish-brown pileus streaked

with darker fibrils, by the rosy gills at maturity and by the whitish stem. When moist the color varies considerably. Sometimes it becomes almost white on drying. *E. clypeatum* has had the reputation in Europe of being *poisonous*, but is eaten with impunity by some who claim it is harmless. Even if its edibility is established, the amateur may have some difficulty in being certain of the species. The pileus is often persistently campanulate with an obtuse apex which separates it from forms having grayish caps.

592. Entoloma rhodopolium Fr. (Suspected)

Syst. Mycol., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 338.
Murrill, Mycologia, Pl. 92, Fig. 4 (as *E. grayanum*).
Gillet, Champignons de France, No. 275.
Plate CV of this Report.

PILEUS 4-8 cm. broad, *campanulate* then expanded-plane, *firm*, hygrophanous, *umber to fuscous* (moist), pale livid-gray and silky shining (dry), *glabrous*, cuticle slightly differentiated with subcartilaginous hyphae, with a gelatinous feel but not viscid, undulate and even on the margin. FLESH watery then white, scissile. GILLS *adnate*, becoming emarginate, somewhat *subdistant*, sometimes veined, moderately *broad*, whitish then *deep rose color*, edge minutely eroded. STEM 4-10 cm. long, 6-12 mm. thick, *pure white*, subequal, tapering up or down, sometimes curved, *glabrous*, apex furfuraceous, white, spongy-stuffed then hollow, with a thickish, fibrous, subcartilaginous cuticle, readily splitting longitudinally on drying. SPORES subglobose, 5-6 angled, 6-9 micr. in diameter, (with a few larger ones), deep rose color in mass. CYSTIDIA none. ODOR and TASTE *none*.

Solitary or subcaespitose. On the ground, mixed or frondose woods. August-September. New Richmond, Ann Arbor.

The deep rosy spores, pure white stem, the toughish subcartilaginous pileus and colors are characteristic for our plants. The species may have an odor at times. Fries says it has scarcely any odor; others report a farinaceous odor. Our plants differ from the typical description in the toughish cuticle on the pileus and stem although collected in moist weather. The pileus is often dusted on top by the rosy spores as in *Clitopilus abortivus*. It differs fundamentally from *E. griseum* Pk. in the deep rose-colored gills and the glabrous and shining-white stem, but agrees with it in being firm, and in

the structure of the cuticle of pileus and stem. *E. griseum* has a farinaceous odor and taste.

593. Entoloma nidorosum Fr. var. (Suspected)

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 94, Fig. 3.
Swanton, Fungi, Pl. 42, Fig. 17.

PILEUS 2-5 cm. broad, convex, obtuse, grayish-*brown* (moist), hygrophanous, edge incurved, minutely tomentose-silky. FLESH thin, white, *fragile*. GILLS adnexed, *broad, subdistant,* flexuose, pale flesh color. STEM 4-7 cm. long, 4-8 mm. thick, equal or subequal, stuffed soon *hollow,* pruinose at apex, slightly fibrillose, whitish. SPORES angular, ovate, angles not definite except the very marked angle at the oblique prominent apiculus, 8-10 micr. long (with apiculus), 6-7 micr. wide; flesh color. ODOR *strongly acid* or alkaline.

Solitary. On mosses, in a sphagnum bog. Ann Arbor. September. Rare.

Differs from the type in the obtuse to subumbonate cap, less slender habit and by not being entirely glabrous. The European plant is said to have an umbilicate or depressed pileus and slender stem.

594. Entoloma sericatum Britz.

PILEUS 3-8 cm. broad, campanulate then plane, subumbonate, grayish-brown (moist), *fading,* paler to creamy-buff or whitish (dry), *umbo darker while drying,* hygrophanous, margin faintly striatulate (moist) elsewhere even, glabrous, silky-shining (dry), surface scarcely differentiated, margin at length splitting or recurved. FLESH thin, concolor, scissile. GILLS *narrow,* narrowed to a point in front, moderately close, thin, *adnexed* becoming emarginate, white at first, maturing slowly, at length *pale flesh color,* edge rather eroded. STEM *long and somewhat slender,* 5-10 cm. long, 5-10 mm. thick, *pure shining white,* variously curved, obscurely undulate, innately silky-striatulate but *glabrous,* equal or somewhat attenuated below, white-fibrous-stuffed within then somewhat hollow, splitting longitudinally (dry), apex pruinose. SPORES angular-tuberculate, slightly longer than wide, 8-10 x 6-8.5 micr., apiculus prominently oblique, flesh color in mass. CYSTIDIA none. TASTE and ODOR farinaceous.

Gregarious or subcaespitose. On the ground among leaves and debris in conifer and frondose woods. Ann Arbor, New Richmond. September. Frequent, abundant locally.

The fading colors of the pileus, the pure white, glabrous, long stem, the narrow gills and pale spores distinguish this species. Britzelmayr gives no description except the color of the pileus and the size of the spores, and hence I have used his name to avoid a new one. It has the stature and the colors of *E. rhodopolium,* but differs in its farinaceous odor, the spores, narrow gills and the striate margin of the pileus.

595. Entoloma griseum Pk.

N. Y. State Mus. Bull. 75, 1904.

PILEUS 3-7 cm. broad, campanulate-convex, obtuse, *firm,* then fragile, glabrous, *margin even* and often wavy at length, subhygrophanous, *grayish-brown,* sometimes pale umber (moist), scarcely fading, innately silky (dry), *cuticle somewhat differentiated forming a thin, separable pellicle,* margin decurved. FLESH hygrophanous, *very scissile,* moderately thin. GILLS adnexed, becoming emarginate, moderately broad, close or slightly subdistant, whitish-grayish, slowly flesh color, sometimes veined. STEM 3-8 cm. long, 4-10 mm. thick, subrigid, equal or attenuated either upwards or downwards, silky-fibrillose, *whitish or tinged gray,* stuffed to hollow, sometimes solid below, subshining. SPORES tuberculate-angular, 7-9 x 6.5-8 micr., *sphoeroid,* apiculus prominent, pale flesh color in mass. ODOR and TASTE farinaceous, at least when flesh is crushed, rarely lacking this odor.

Gregarious or solitary. On the ground in low woods, both coniferous and frondose. Throughout the State, Marquette, New Richmond, Ann Arbor. May-October. Frequent but scattered.

This species is similar at times to *E. sericeum* Fr.; it is a stouter plant, usually without an umbo on the pileus, and the colors are paler. The margin of the cap is not striate in typical plants, but this character is sometimes obscure. Specimens which lack the mealy odor are not infrequent in spring. The flesh is rather firm but shot through with watery lines and is scissile. The stem is often abruptly attenuated below and its interior is composed of a fibrous pith at first which disappears in places leaving cavities. The cuticle of the pileus has a slight gelatinous feel but is never viscid. The gills are not always noticeably grayish but merely

pallid. Forms which seem otherwise to belong here have a slight alkaline odor. Solitary specimens appear as early as May around Ann Arbor. I have found this species in the Adirondack Mountains, and it agrees in all respects with our plants except that the spores are slightly smaller, 6-7.5 x 6-7 micr., the size assigned to them by Peck.

596. Entoloma sericeum Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 320.
Gillet, Champignons de France, No. 276.
Ricken, Blätterpilze, Pl. 72, Fig. 5.
Plate CVI of this Report.

PILEUS 2-6 cm. broad, convex expanded, *more or less* umbonate, glabrous, hygrophanous, *umber-brown (moist)*, umbo darker, fading to grayish-brown and silky-shining (dry), striatulate on margin when moist, margin at first regular then wavy. FLESH thin, concolor, moist. GILLS adnexed-emarginate or broadest behind and rounded-adnate, moderately *broad*, close to subdistant, gray or grayish-white at first, edge entire. STEM 2-6 cm. long, 3-5 mm. thick, stuffed then hollow, equal or tapering upward, sometimes compressed or twisted, *grayish-brown or tinged with gray*, innately silky-fibrillose. SPORES sphoeroid, tuberculate-angular, 8-9.5 (incl. apiculus) x 6-7 micr., apiculus prominent, deep flesh color in mass. ODOR and TASTE farinaceous.

Gregarious. On the ground, in open woods among grass or fallen leaves. Ann Arbor. June-July. Infrequent.

This species is characterized by its medium to small size, dark brown cap, the presence of an umbo, the grayish gills and the mealy odor. The umbo almost disappears. In Europe it is said to be abundant and to grow in grassy pastures or meadows. I have not found it in such a habitat. The surface of the cap has a sheen almost velvety as shown in our illustration. *E. griseum* differs in the truly convex cap without an umbo, and is usually larger. The spores of these two species are alike, and there is some question whether they do not run into each other.

597. Entoloma strictius Pk. (Suspected)

N. Y. State Mus. Rep. 23, 1872.

Illustrations: Ibid, Pl. 2, Figs. 6-9.
Atkinson, Mushrooms, Fig. 138, p. 146, 1900.
Plate CVII of this Report.

PILEUS 2.5-6 cm. broad, rigid-fragile, obtusely conic-campanulate to broadly campanulate, then expanded and often *strongly umbonate*, glabrous, hygrophanous, umber to watery cinnamon (moist), pearl-gray and silky-shining (dry), margin even or pellucid-striatulate when moist, somewhat wavy, thin and at length splitting. FLESH quite thin, concolor, scissile. GILLS adnexed, then emarginate or sinuate, *ventricose, broad,* narrowed in front, close to subdistant, white or pallid then rosy-incarnate, edge minutely eroded. STEM 6-10 cm. long, 3-7 mm. thick, *slender, cylindrical* or tapering slightly upward, sometimes obscurely bulbous, *strict,* stuffed then hollow, rigid-fragile, twisted, fibrillose-striate, pallid to pale grayish-white. SPORES elongated-angular, curved toward apiculus, 10-12 x 6-8 micr., nucleate, cinnamon-rose color in mass. BASIDIA about 40 x 8-9 micr., 4-spored. CYSTIDIA none. ODOR and TASTE none.

Subcaespitose. In swampy or low woods or near sphagnum swamps, near or on much-decayed stumps, etc. July-August. Ann Arbor, New Richmond, East Lansing. Infrequent.

Very distinct. The pileus is usually markedly campanulate, with a strikingly mammate umbo, very hygrophanous becoming silvery shining when dry, and the thin flesh is at length split on the margin. The stem is very straight and easily splits longitudinally. The spore-mass is peculiarly colored; when deposited thickly on white paper it has a deep rufous or cinnamon-rose color. The width of the spores are given too large by Peck. The striations on the margin of the cap soon disappear or are lacking. The smaller specimens have the appearance of a Nolanea.

598. Entoloma grayanum Pk.

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Atkinson, Mushrooms, Fig. 157, p. 145, 1900.
Plate CVIII of this Report.

PILEUS 4-12 cm. broad, campanulate-convex, then expanded and obtuse or broadly umbonate, *firm, glabrous, hygrophanous,* watery-white, *whitish or yellowish-white* (moist), shining and whitish (dry), not striate, sometimes wrinkled on disk. FLESH *relatively thin,* whitish or tinged yellowish, *scissile,* not compact. GILLS adnexed, becoming emarginate, at first rounded behind, *broad,* ventricose, rather close, thickish, white then deep flesh color, edge entire or eroded-crisped. STEM 5-12 cm. long, 10-20 mm. thick, equal or subequal, firm, *stout,* variously thickened, fibrous-stuffed, solid at base, straight or curved, glabrous, silky-shining, watery-white or tinged faintly with yellowish. SPORES sphoeroid, angular, 5-6 angled, 8-10 (incl. apiculus) x 7-9 micr., bright flesh color in mass. CYSTIDIA and STERILE CELLS none. BASIDIA clavate, 45 x 12 micr., 4-spored. ODOR and TASTE *none* or rarely subfarinaceous to slightly pungent.

(Dried: Pileus fuscous; stem sordid; gills dingy flesh-color.)

Solitary or subcaespitose-gregarious. On the ground in woods. August-October. Ann Arbor, Negaunee.

Distinguished by its whitish or yellowish-white pileus which has a watery cast, the hygrophanous hence scissile flesh, and the spores. It is often a noble plant and our forms surpass considerably the sizes given by Peck. In fact its characters are in some respects so near those of *E. grande* Pk., that only its hygrophanous flesh and thinner pileus seem to separate it. The spores are sharply angled and the apiculus usually stands out straight instead of obliquely as in many others. Atkinson (1900) describes a form with a drab-colored pileus. In dry weather the yellowish hues may be altogether lacking.

599. Entoloma speculum Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 95, Fig. 2.
Cooke, Ill., Pl. 308.
Plate CIX of this Report.

PILEUS 2-6 cm. broad, convex-expanded then expanded-plane or slightly depressed around the umbo, margin somewhat wavy, *hygrophanous, pinkish-white* (moist), white and silky-shining (dry), the *umbo* obtuse and when moist whiter than *the rest of the pileus,* margin even or obscurely striatulate (moist). FLESH thin, fragile, white. GILLS emarginate, broad behind, *subdistant,* sometimes veined, *white at first* then *deep rose-colored,* edge suberoded. STEM 3-9 cm. long x 3-8 mm. thick, *equal,* stuffed by loose pith then hollow, sometimes compressed, *fragile, shining-white,* silky-fibrillose or striatulate, pruinose at apex. SPORES sphoeroid-angular, or slightly longer in one direction, 7-9 (including apiculus) x 6-7.5 micr., apiculus suboblique, nucleate. CYSTIDIA none. ODOR and TASTE *none.*

(Dried: Pileus dark rufous-brown or fuscous-brown, stem brownish.)

Solitary or subcaespitose. In grassy places in woods or on debris. Ann Arbor, New Richmond. Infrequent.

The persistently white umbo, deep color of the gills, fragile texture and the silvery shining-white pileus when dry, characterize the species. The size varies in different collections, normally rather small, but in favorable situations becoming larger than figured in the plates. The stem tends to elongate and is very fragile. The color is not retained on drying. The spores are a little large in some specimens but do not agree with the large size given by Saccardo and Massee, each of whom must have dealt with a different species. The surface of the pileus lacks any kind of differentiated cuticle. The trama of the gills is parallel and the margin of the cap is at first incurved.

Section IV. Conoidei. Pileus conic or campanulate, not expanded, moist; stem slender, long and hollow; on mosses, especially sphagnum.

600. Entoloma salmoneum Pk. (Suspected)

N. Y. State Mus. Rep. 24, 1872.

Illustrations: N. Y. State Mus. Rep. 24, Pl. 4, 1872.
Hard, Mushrooms, Fig. 199, p. 247, 1908.

PILEUS 10-25 mm. broad, often longer than wide, thin, *conical* or campanulate, *papillate* or subacute, subhygrophanous or moist, *deep salmon color* or tinged with orange, margin even or nearly so. GILLS adnexed, *broad,* subdistant, ascending, ventricose, salmon-yellow or salmon-colored. STEM 5-12 cm. long, 2-4 mm. thick, slender, equal, glabrous, pruinose at apex, *hollow,* salmon-colored, innately silky-striatulate, becoming subcartilaginous. SPORES quadrate-nodulose, measuring 10-12.5 micr. diagonally, about 9 micr. wide from side to side, apiculus prominent, rosy-salmon in mass. CYSTIDIA few or none.

(Dried: Reddish-cinnamon to chestnut color.)

Gregarious or scattered. On the ground in conifer woods, in moist places, usually among mosses. August and September. In northern Michigan, Bay View, Negaunee, Detroit. Infrequent and local.

A beautiful little Entoloma, easily mistaken for a Nolanea. The spores are unique for the most part; under the microscope they appear like 4-sided crystals, but with the sides less straight. Simon Davis reports that the stem and sometimes the pileus may be tinged greenish.

601. Entoloma peckianum Burt. var.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. F., Figs. 9-16.

PILEUS 3-5 cm. broad, campanulate or convex-expanded, *brownish-ashy* to grayish, *streaked with brown-gray fibrils, umbonate,* glabrescent, even on margin. FLESH white, thin. GILLS adnate, becoming emarginate-sinuate, rather broad, white then bright flesh color. STEM 5-7 cm. long, 4-6 mm. thick, *whitish,* sometimes ashy-tinged, equal or tapering downward, straight or flexuous,

stuffed then hollow, white-mycelioid at base, glabrous, sometimes fibrillose-striatulate, *flocculose-pruinose* at apex, subshining and subcartilaginous when dry. SPORES angular, slightly longer than wide, 5-6 angled, 8-9.5 x 6-7.5 micr., apiculus prominent, nucleate. CYSTIDIA none.

Subcaespitose or solitary. Low grounds and swamps of frondose trees. July, August and September. Ann Arbor, New Richmond, Marquette and Houghton. Infrequent.

This Entoloma seems to have characters of both *E. peckianum* and *E. murinum* Pk. It differs from the former in its smaller spores, color and size, as these are given in Peck's description. Our plants were referred to *E. peckianum* by Peck. This species differs from *E. murinum* in the smaller spores and size and in the even margin of the cap. From both it would seem to differ in its lack of a conical pileus and in its stouter habit, so that it may turn out to be a distinct species belonging to the section Leptonidei. In his remarks on *E. murinum,* Peck indicates that it is smaller than *E. peckianum,* although he gives the same size in the published descriptions. Our plants always have spores of the size given.

602. Entoloma cuspidatum Pk. (Suspected)

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Ibid, Pl. 2, Fig. 14-18.
Plate CX of this Report.

PILEUS 1.5-5 cm. broad, conical or persistently *conical-campanulate,* 1-3 cm. high, glabrous, silky-shining, *pale yellow,* even or at length rimulose, *bearing an elongated papilla at the apex,* margin at first straight, at length irregular. FLESH thin. GILLS ascending, narrowly adnate, broad in middle, subdistant, *pale yellow at first,* then bright flesh color, edge uneven. Stem 4-12 cm. long, 2-3 mm. thick, equal, hollow, strict, sometimes twisted, glabrous, *pale yellow,* fibrous or with a subcartilaginous cuticle. SPORES subquadrate, coarsely angular, nucleate, apiculus prominent, 9-12 micr. diam., bright flesh color. CYSTIDIA none; STERILE CELLS lacking on edge of gills. Trama of gills parallel. ODOR and TASTE mild.

Gregarious. On mosses, sphagnum, leucobryum, etc., in swamps and bogs.

Eloise, near Detroit. August. Rare.

A unique plant, collected by Mrs. T. A. Cahn of the Detroit

Mycological Club near Eloise. It does not seem to have been reported outside of New York. The pileus and stem fade on losing moisture, but it is not hygrophanous. It is a close relative of *E. salmoneum,* but with different colors and marked by the prominent cusp at the apex of the cap.

Clitopilus Fr.

(From the Greek, *klitos,* a slope, and *pilos,* a felt-cap.)

Pink-spored, without volva or annulus. Stem *fleshy or fibrous,* not cartilaginous, confluent with the pileus whose margin is at first involute. Gills *decurrent or adnate* but *not becoming sinuate nor seceding.* Pileus usually depressed or umbilicate.

Terrestrial plants, often with a farinaceous odor or taste; none are known to be poisonous. The decurrent gills ally them with the genus Clitocybe of the white-spored group.

The PILEUS is glabrous or pruinose in most species; in *C. abortivus* a delicate silky tomentum covers the surface; in a number it is hygrophanous, and in *C. orcella* it is slightly viscid. The larger species are of a firm consistency; the smaller, membranous or fragile. The colors are usually dull or pale, whitish, grayish or brownish. The GILLS furnish the characteristic mark of the genus. Although usually decurrent, they are sometimes broadly adnate as in Entoloma and Leptonia, but in that case do not become sinuate-emarginate in age, nor readily separate from the stem. When decurrent, they are usually narrowed behind and end in a point on the stem as in many Clitocybes. When mature the gills of the different species present the same variation of color as those of Entoloma. Some are pale flesh-colored or deep rose; Peck grouped them into three groups with this difference in color as a basis. At first the gills are usually white or whitish, but in *C. micropus, C. albogriseus, C. abortivus* and *C. novaboracensis* they are pale gray or ashy at first. The STEM is fleshy-fibrous but may become rather rigid in the smaller forms. It is solid in all the larger forms and in this respect differs markedly from most Entolomas. There is no cartilaginous cuticle as in Eccilia. The SPORES are angular in some species like those of Entoloma, rounded in others as in Clitocybe, varying in intensity of color as shown by the mature gills or spore-prints. Ricken has moved all those with non-angular spores to other genera and omits the genus Clitopilus entirely. CYSTIDIA are absent as far as known. The

TASTE is often farinaceous, sometimes quite strong; that of *C. novaboracensis* is bitter; in others it is mild or insipid.

Fries divided the European species into two sections: one with deeply decurrent gills and the margin of the pileus at first flocculose; the other with adnate or subdecurrent gills and the margin of the pileus naked. Peck suggested the use of the different shades of pink of the mature gills as a basis for the sections. It seems to me that the character of the spores is more fundamental than any of these, since the angular spores simulate those of Entoloma, the rounded ones those of Clitocybe. In this sense, there would be two sections; the Angulosporae and the Globosporae. The genus is not well represented in Michigan.

Key to the Species

(A) Spores angular.
  (a) Pileus hygrophanous, 1-3 cm. broad, fragile.
    (b) Odor and taste farinaceous; pileus grayish-brown (moist). 605. *C. subvilis* Pk.
    (bb) Not farinaceous; pileus pinkish-white (moist). Spores smaller than in the preceding. 604. *C. woodianus* Pk.
  (aa) Pileus not hygrophanous.
    (b) Pileus 5-10 cm. broad, grayish-brown, often abortive. 603. *C. abortivus* B. and C.
    (bb) Pileus less than 5 cm. broad, whitish to grayish or smoky-cinereous.
      (c) Odor none.
        (d) Gills white then somewhat rosy; stem stuffed to hollow. 609. *C. subplanus* Pk.
        (dd) Gills dark ashy; stem solid or fibrous. 606. *C. undatus* Fr.
      (cc) Odor farinaceous; gills gray at first.
        (d) Stem slender, 3-6 cm. long, solid; pileus glabrous. 608. *C. albogriseus* Pk.
        (dd) Stem short, 1-2 cm. long, solid; pileus silky. 607. *C. micropus* Pk.

(AA) Spores not angular. (Slightly in *C. novaboracensis*.)
  (a) Pileus somewhat viscid (moist), white or whitish, 3-7 cm. broad. 611. *C. orcella* Fr.
  (aa) Pileus not viscid.
    (b) Taste bitter; pileus concentrically-cracked, brownish-gray; gills deeply decurrent. 612. *C. novaboracensis* Pk.
    (bb) Taste not bitter.
      (c) Plants very caespitose, fragile, pileus 5-15 cm. broad, whitish, moist. 613. *C. caespitosus* Pk.
      (cc) Plants gregarious, firm; pileus 3-10 cm. broad, white or tinged gray. 610. *C. prunulus* Fr.

Section I. Angulosporae. Spores angular or tuberculate.

603. Clitopilus abortivus B. & C. (Edible)

Ann. Nat. Hist., 1859.

Illustrations: Hard, Mushrooms, Fig. 202, p. 250, 1908.
(Abortive form) Ibid, Fig. 203.
(Abortive form) Minnesota Mushrooms, Fig. 33, p. 57, 1910.
N. Y. State Mus. Bull. 54, Pl. 78, 1902.
Plate CXI of this Report.

PILEUS 5-10 cm. broad, firm, convex then plane to subdepressed, dry, at first covered with a delicate silky tomentum, glabrescent, *grayish-brown, dull, becoming isabelline,* margin even. FLESH *white.* GILLS decurrent, varying to merely adnate with a tooth, thin, close, *pale gray at first,* then *rosy to salmon color,* rather narrow. STEM 3-9 cm. long, 6-12 mm. thick, solid, fibrous, subequal, minutely flocculose, sometimes striate, pale grayish-brown to isabelline. SPORES elongated angular, irregular, 8-10 x 5-6 micr., nucleate, *pale rose color* or almost salmon color *in mass.* CYSTIDIA none. ODOR and TASTE somewhat farinaceous.

(Dried: Pileus brownish-gray, stem sordid white, gills dingy deep flesh color).

Subcaespitose, gregarious, occasionally solitary. Habitat varies: found frequently in low woods of elm, maple, etc., on wooded hillsides, ravines, of frondose or mixed woods; sometimes on rotten wood. Late August to middle October. Common in southern Michigan.

Often some of the individuals of one patch are attacked—apparently by some other fungus—and do not develop the cap and gills, but remain as *abortive,* whitish masses, with the appearance of puff-balls; the interior however retains its whitish color, and does not become brown, olive or purple as in puff-balls. Their shape varies from globular to depressed, often umbilicate above. Sometimes all of the specimens are found in this condition, but careful searching of the locality usually brings to light normal individuals. McIlvaine says the abortive ones are fair eating.

604. Clitopilus woodianus Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 2-5 cm. broad, convex, then plane, obtuse or slightly depressed, sometimes umbonate, fragile, *hygrophanous, brownish-*

buff or watery-white (moist), white or tinged slightly yellowish or brownish and silky shining (dry), glabrous, margin *striatulate* (moist). FLESH thin, white. GILLS *broadly adnate to subdecurrent,* not sinuate, moderately close, rather broad, thickish, whitish then *deep flesh-colored.* STEM 4-6 cm. long, 2-5 mm. thick, equal or tapering upward, glabrous, stuffed with a firm pith, cuticle subcartilaginous, innately silky-striatulate, somewhat pellucid-white, elastic. SPORES sphoeroid-angular, 7 micr. diameter, nucleate, deep flesh color in mass. TASTE and ODOR none.

Solitary. On the ground or on rotten logs in frondose or cedar woods. Ann Arbor, Marquette. September. Rare.

This differs from *C. subvilis* in its small spores, whitish color, close gills and lack of odor. The stem is rather elastic for the genus and inclines to that of Nolanea. The pileus is depressed around the low umbo and tinged brownish there. It has a stouter stem and smaller spores than *Entoloma sericellum*, and is hygrophanous.

605. Clitopilus subvilis Pk. (Edible)

N. Y. State Mus. Rep. 40, 1887.

PILEUS 1.5-3 cm. broad, fragile, convex-campanulate, depressed to umbilicate, *hygrophanous, brown or watery grayish-brown* (moist), paler and silky-shining when dry, margin decurved and somewhat wavy, slightly striatulate (moist), glabrous. FLESH thin, moist. GILLS broadly adnate or subdecurrent, *subdistant,* rather broad, whitish then flesh-colored, edge uneven. STEM 2-5 cm. long, 2-3 mm. thick, fleshy-fibrous, stuffed then hollow, equal or subequal, glabrous, tinged brownish, silky-shining. SPORES strongly 4-6 angled, subquadrate to subrectangular in focus, sides straight or concave, apiculus oblique, 8-10 x 7-9 micr., nucleate. CYSTIDIA none. ODOR and TASTE *farinaceous.*

(Dried: Dark brown to umber.)

Solitary. Ground in hemlock woods. Houghton. July-August. Infrequent.

It differs from *C. woodianus* in the color, subdistant gills and spores. From similar species in other pink-spored genera, it differs by its fleshy-fibrous stem and its adnate, not seceding gills.

606. Clitopilus undatus Fr.
(Sense of Patouillard.)

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 96, Fig. 4.
Patouillard, Tab. Analyt., No. 428.
Cooke, Ill., Pl. 486.

PILEUS 1.5-3.5 cm. broad, *fragile*, deeply umbilicate to subinfundibuliform, *dark smoky-gray* (moist), fading, opaque, silky when dry, splitting radially in age, sometimes obscurely zonate, *margin wavy*, fleshy, concolor. GILLS *decurrent*, broad in the middle, thin, close, *dark cinereous*, at length tinged by the spores, edge entire. STEM short, 1.5-2 cm. long, 1.5-3 mm. thick, equal, terete, solid, even, tough-elastic, glabrous, *brownish-ashy to pale brown*. SPORES irregularly subglobose-oval, angular, 7-9 x 6-6.5 micr., nucleate, reddish-flesh color in mass. CYSTIDIA none. ODOR none.

On mossy ground or much decayed wood, in open frondose woods. Ann Arbor. August. Infrequent.

Known by its dark gray gills, lack of odor and angular spores. Ricken refers it to Paxillus and assigns to it smooth spores, in which he differs from other authors. Our plants had a solid stem while Fries describes the stem with a cavity. In all other respects it agrees well with the Friesian description. Patouillard reports the stem either solid or hollow and doubtless he had our species.

607. Clitopilus micropus Pk.

N. Y. State Mus. Rep. 31, 1879.

Illustration: N. Y. State Mus. Bull. 54, Pl. 78, 1902.

PILEUS small, 1-2 cm. broad, *fragile*, convex then depressed, *umbilicate, silky, gray*, usually slightly zoned on margin, margin decurved. GILLS adnato-decurrent, *narrow*, narrowed in front and behind to a point, close, gray then *salmon-colored*. STEM *short*, 1-2 cm. long, 2-3 mm. thick, solid or with a slight cavity, *pruinose*, gray, white-mycelioid at base. SPORES elongated angular-tuberculate, 9-10 x 5-6 micr., nucleate, pale salmon color. ODOR and TASTE *farinaceous*.

(Dried: Dark gray.)

Gregarious or subcaespitose. On the ground, grassy places, sandy fields or thin woods. July-September. Throughout the State. Ann Arbor, Detroit, New Richmond, Marquette. Frequent.

Sometimes it occurs in abundance in one place. There is a pale variety, almost white, which is widely distributed. The short stem, umbilicate and subzonate pileus distinguish it from *C. albogriseus*. It is rarely if ever found in deep woods. It differs from *C. subplanus* in its fragile cap.

608. Clitopilus albogriseus Pk. (Edible)

N. Y. State Mus. Rep. 31, 1879.

PILEUS 1-3 cm. broad, convex, *firm,* then plane, depressed or umbilicate, glabrous, pale gray, margin even. GILLS adnato-decurrent, close, *rather broad*, grayish then flesh color. STEM 3-6 cm. long, 2-5 mm. thick, solid, subequal, glabrous, pale gray. SPORES elongated-angular, 10-12 x 6-7 micr., apiculus oblique and prominent. ODOR and TASTE *farinaceous.*

Gregarious or solitary. Ground, in conifer or frondose woods. Ann Arbor, Marquette, Houghton. July-September. Not infrequent in northern Michigan.

The large spores and longer stem separate it from *C. micropus;* the solid stem and the spores from *C. subplanus*. These three are closely related.

609. Clitopilus subplanus Pk.

N. Y. Mus. Bull. 122, 1908.

PILEUS 2-3 cm. broad, convex-expanded, somewhat plane, depressed or umbilicate, glabrous, innately silky, *grayish-white* or whitish. GILLS adnato-decurrent, close, moderately broad, *white then flesh color*. STEMS 2-4 cm. long, 2-4 mm. thick, *toughish,* terete or subcompressed, subsilky, cuticle subcartilaginous, even. SPORES angular, 9-11 x 6-7 micr., flesh-colored in mass; no cystidia.

Scattered. On decaying leaves, etc., in mixed woods. New Richmond, Bay View. July-September. Frequent locally.

This species differs from the two preceding in its white gills when young and its stuffed to hollow stem. The whole plant is rather tough and its taste and odor are not farinaceous.

Section II. Globosporae. Spores rounded, neither angled nor tubercular.

610. Clitopilus prunulus Fr. (Edible)

Syst. Mycol., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 135, p. 142, 1900.
Hard, Mushrooms, Fig. 200, p. 248, 1908.
N. Y. State Mus. Rep. 48, Pl. 14, 1896, Bot. ed.
Swanton, Fungi, Pl. 42, p. 131, 1909.
Ricken, Blätterpilze, Pl. 27, Fig. 5 (as *Paxillus prunulus*).
Clements, Minn. Mushrooms, Fig. 34, p. 58, 1910.
Cooke, Ill., Pl. 322.

"PILEUS 5-10 cm. broad, at first obtuse, convex then nearly plane, *firm, dry, pruinate,* white to dark-gray, often eccentric, margin even and often wavy. FLESH white. GILLS deeply decurrent, *subdistant, narrow,* white then flesh-colored. STEM 3-8 cm. long, 5-15 mm. thick, solid, naked, *striate,* subequal or tapering, sometimes ventricose. SPORES subfusiform to subelliptical, pointed at ends, 10-12 x 5-7 micr., smooth, with three deep longitudinal furrows, tinged salmon. ODOR and TASTE *farinaceous.*"

Ground in open woods. July-September. Ann Arbor, Lansing. Infrequent.

The general appearance is that of *C. orcella* but its cap is firm and not viscid and the stem is glabrous. Massee and Hard give the spores too small. Only Hennings, in Engler and Prantl, and Ricken mention the characteristic furrows of the spores. It has not been seen by me in abundance and is apparently rather rare in the State. Its edible qualities are highly praised. In France it is called the "Mousseron" by the peasants. An abortive form is described by McIlvaine.

611. Clitopilus orcella Fr. (Edible)

Syst. Mycol, 1821.

Illustrations: N. Y. Mus. Rep. 48, Pl. 14, 1896, Bot. ed.
Hard, Mushrooms, Fig. 201, p. 249, 1908.
Cooke, Ill., Pl. 323.
Gillet, Champignons de France, No. 145.
Patouillard, Tab. Analyt., No. 427.

PILEUS 3-9 cm. broad, convex at first, soon expanded, plane then depressed, *soft, somewhat viscid*, silky, white to whitish or tinged yellowish, margin often undulate-lobed, even. FLESH white. GILLS deeply decurrent, *close*, narrow, edge entire, white, then pale salmon-colored from spores. STEM 3-5 cm. long, 4-10 mm. thick, rather short, solid, soft, *flocculose*, sometimes eccentric, subequal to subventricose. SPORES 9-11 x 4-6 micr., fusiform to oval-elongated, narrowed toward apiculus, nucleate, pale salmon color in mass, furrowed, smooth. ODOR and TASTE *farinaceous*.

(Dried: Pileus and stem dull-white; gills salmon-colored.)

Solitary or gregarious. On the ground or on moss, in low oak and maple woods, grassy places, etc. July-September. Ann Arbor, Detroit, Jackson. Frequent in southern Michigan.

This apparently differs from *C. prunulus* in its viscid pileus when moist, in its closer gills and the soft texture. It is more abundant than that species. Its edibility is the same and for that purpose need not be distinguished from the preceding. I have not found it in conifer regions. It is often considered identical with *C. prunulus*, but is at least a variety.

612. Clitopilus novaboracensis Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustrations: Hard, Mushrooms, Fig. 204, p. 251, 1908.
Compare illustrations of *C. popinalis* Fr.
Fries, Icones, Pl. 96, Fig. 1.
Cooke, Ill., Pl. 485.

PILEUS 3-6 cm. broad, convex, plane or umbilicato-depressed, *concentrically rivulose*, glabrous, obscurely zonate toward margin, which is inrolled at first and often wavy, dingy-white, tinged ashy. FLESH thin, white, flaccid. GILLS deeply decurrent, crowded,

narrow, brownish-ashy to pallid with a slight flesh color, becoming ashy-stained, edge entire. STEM 3-6 cm. long, 2-5 mm. thick, rather slender, *flexible,* stuffed then hollow, *pruinose or tomentose,* white-mycelioid at base, subequal, concolor or paler than pileus. SPORES oval, obscurely or not at all angular, 5-6 x 4-4.5 micr., apiculate, pale flesh color in mass. ODOR farinaceous. Taste bitterish or very bitter.

(Dried: Pileus and gills brownish-gray.)

Subcaespitose or solitary. On the ground in hemlock woods. Ann Arbor, Bay View. August. Infrequent.

Var. *brévis* Pk. is reported by Longyear in frondose woods, East Lansing. This variety is pure white, with gills merely subdecurrent and stem short. The species is referred by some to *C. popinalis* Fr. The spores of the American plant appear rounded under ordinary magnification, but when magnified about 1500 diameters, it is seen that they are slightly angled. The angles are not sharply marked and the spores never appear tubercular-angled as figured by Cooke for *C. popinalis;* some appear to be altogether rounded. The dark plants may be mistaken for *Clitocybe cyathiforme,* but the pileus of the latter is not rivulose-cracked. Some Tricholomas have a pileus of the same color and markings. The plants often turn ashy where bruised.

613. Clitopilus caespitosus Pk.

N. Y. State Mus. Rep. 41, 1888.

Illustrations: Plates CXII, CXIII of this Report.

PILEUS 5-15 cm. broad, at first convex, soon expanded and plane to depressed, somewhat firm but brittle, *very fragile* when moist or water-soaked, glabrous, whitish to gray-tinged when young, watery-dingy-white (moist), *dull whitish to pale tan* and silky-shining (dry), even, margin at first inrolled, often recurved and split in age. FLESH pallid to white, thin, subhygrophanous, somewhat scissile. GILLS very *crowded* and *narrow,* adnate-decurrent, thin, dingy *pale* flesh color, edge sometimes minutely crenulate. STEM 3-7 cm. long, 5-12 mm. thick, *equal or tapering downward,* silky-fibrillose, scurfy at apex, stuffed, fragile in age, pallid, easily splitting. SPORES short-oblong, 4-5 x 2.5-3 micr., smooth, sordid-white with a pink tinge in mass. ODOR slightly fragrant. TASTE none.

(Dried: Pileus and stem dingy-white tinged tan color; gills brownish-flesh color.)

Very caespitose, sometimes singly. On the ground in open oak and maple woods of southern Michigan; in mixed woods of maple and pine in the north. August-October. Throughout the State. Infrequent.

This is easily mistaken for a Clitocybe. The spores have a dingy flesh tinge in mass, like *Tricholoma personatum* and *Tricholoma panocolum* var. *caespitosum*. In rainy weather it is water-soaked and appears as if hygrophanous. Its fragile flesh and its usually large size separate it from other Clitopili. It seems to be much more closely related to the genus Clitocybe than to Clitopilus.

Leptonia Fr.

(From the Greek, *lepidion,* a small scale.)

Pink-spored. Pileus at length *subexpanded and depressed in center,* umbilicus minutely squamulose, margin at first *incurved.* Stem *cartilaginous,* confluent with the pileus, stuffed, soon hollow. Gills adnexed or adnate, seceding. Spores *angular.*

Terrestrial, lignicolous or sphagnicolous. Rather small, slender-stemmed plants of low wet places in woods or swamps. They correspond to Collybia of the white-spored group. From Nolanea they are distinguished by the more expanded, subumbilicate pileus whose margin is at first incurved instead of straight on the stem.

The PILEUS is often minutely scaly or fibrillose, sometimes glabrous; hygrophanous or merely moist; even or striate on the margin. The colors are often bright, rosy, violet, yellowish, greenish or blue-black. As in Collybia, the pileus tends to expand rather fully, because of the position of the margin when young. The peculiar lustre is due, according to Patouillard, to the presence of air between the hyphae of the surface layer. The GILLS secede from the stem at maturity as in Nolanea; at first they are either adnexed or adnate. The color when young is to be noted, as it varies in different species, at first it may be gray, bluish, or whitish, at length the gills are colored by the spores. The STEM, as in Nolanea and Eccilia, is cartilaginous, hollow (sometimes stuffed), confluent with the pileus but of a different texture; it is composed of parallel hyphae, with long cells, which are regularly cylindrical. It is usually glabrous and polished, but some species are dotted with colored squamules. It is often compressed and furrowed longi-

tudinally. The SPORES vary from flesh color to bright rose and are often prominently angled, sometimes tuberculate. CYSTIDIA are uusually lacking except in *L. seticeps.*

The species of this genus are rather difficult to diagnose. In some cases the color is rather striking, as for example, of *L. formosa* and *L. rosea;* in others the color varies considerably in different specimens of the same species, e. g., *L. asprella,* so that a microscopic study must be the final resort. Not much is known concerning their edibility, although several species appear quite frequently. Some of the species are rarely found and this accounts for the smaller number of species for the State. All species likely to occur in the State are included in the key.

Key to the Species

(a) Stem and pileus rose-tinged; on sphagum. 616. *L. rosea* Longyear.
(aa) Stem and pileus white, becoming blackish on drying; pileus striate; gills adnexed; spores 10-12.5 x 7-9 micr. *L. transformata* Pk.
(aaa) Stem and pileus waxy-yellowish; pileus scaly to fibrillose. 618. *L. formosa* Fr.
(aaaa) Stem and pileus neither rosy, white nor yellowish.
(b) Pileus, stem and gills green (aeruginous).
(c) Odor strongly of mice. *L. incana* Fr.
(cc) Odor not mentioned. *L. aeruginosa* Pk.
(bb) Pileus and stem grayish-brown to fuscous, dark brown, or light-leather color.
(c) Pileus hygrophanous, striatulate.
(d) On rotten wood; gills rounded behind, nearly free, whitish; spores 10 x 7.5 micr. *L. undulatella* Pk.
(dd) On the ground; gills adnate-seceding, tinged gray; spores elongate, 10 x 6-8 micr. 621. *L. asprella* Fr. var.
(cc) Pileus not hygrophanous.
(d) On rotten wood; pileus walnut-brown; gills slightly adnexed. Spores subglobose. 617. *L. seticeps* Atk.
(dd) On the ground; pileus paler.
(e) Pileus innately silky and substriatulate; gills whitish, broad, adnexed; stem glabrous; spores quadrate, 9-11 x 9-10 micr. *L. solsticiales* Fr. (Sense of Ricken.)
(ee) Gills, stem and pileus gray, gills broad; spores sphoeroid, 8-10 micr. *L. grisea* Pk.
(bbb) Pileus and stem violet, bluish-black, smoky or steel-blue.
(c) Stem dotted with dark squamules, at least at apex.
(d) Gills with a black serrulate edge; on the ground. 619. *L. serrulata* Fr.
(dd) Gills with edge concolor; pileus fuscous, squamulose; stem tinged lavender, squamulose; on rotten wood. 614. *L. placida* Fr.
(c) Stem glabrous or with few evanescent squamules.
(d) Gills with a black serrulate edge; pileus grayish-white, umbilicus darker and scaly. *L. subserrulata* Pk.
(dd) Gills unicolorous.
(e) Pileus hygrophanous, striate (moist), squamulose to glabrous; gills grayish, adnate; spores 11-14 x 6-8 micr. 621. *L. asprella* Fr.

(e) Pileus not hygrophanous, not striate.
(f) Pileus at first bluish-black, then smoky-fuscous; gills adnate, ventricose, stem concolor; spores 9-12 x 6-7 micr.; on the ground. 615. *L. lampropoda* Fr.
(ff) Pileus, gills and stem rather dark violet; squamulose-fibrillose on pileus; spores subsphoeroid, 8-10 x 7-8 micr.; on wood, sawdust, etc. 620. *L. euchroa* Fr.

Section I. Nonhygrophanae. The species of this section are not truly hygrophanous nor markedly striate on the pileus but in wet weather they may appear somewhat hygrophanous, and a few species are faintly or finely striate on the pileus.

**Gills white or whitish at first.*

614. Leptonia placida Fr.

Syst. Mycol., 1821.

Illustrations: Fries, Icones, Pl. 97.
Cooke, Ill., Pl. 330.
Plate CXIV of this Report.

PILEUS 3-5 cm. broad, campanulate, then convex, obtuse, rarely depressed, ground color *pale fuscous, covered with brown to blackish silky scales which are denser and darker on disk,* often with an obscure tinge of violet, *not striate.* FLESH pallid, with a pinkish tinge, thin. GILLS *broad behind* but abruptly narrowed and *adnexed,* sometimes subarcuate and subdecurrent, narrowed in front, crowded, thickish, whitish then flesh color from spores, edge concolor, often eroded-crenate. STEM 2-5 cm. long, *rather thick,* 3-8 mm., cartilaginous, stuffed then hollow, often compressed and grooved, sometimes twisted or variously curved, *loosely dotted by lavender or dark blue to blackish squamules above,* squamules rosy or violet below, apex usually thickened, base white mycelioid, sometimes glabrous except at apex. SPORES tuberculate-angular, oblong, 8-10.5 x 5-6 micr., apiculus oblique. CYSTIDIA none.

(Dried: Dark fuscous throughout.)

Gregarious. On rotten wood, stumps and logs, in low woods of elm, maple, etc. June to October. Ann Arbor, Detroit. Frequent at times.

A beautiful plant, with a stouter and more curved stem than the terrestrial Leptonias. The shades of lavender and blue vary considerably in different collections, but the peculiar dark scales on the pileus and stem are unmistakable. The gills of our plants always have a decurrent tooth.

615. Leptonia lampropoda Fr.

Syst. Mycol., 1821.

Illustrations: Cooke, Ill., Pl. 331.
Gillet, Champignons de France, No. 434.
Ricken, Blätterpilze, Pl. 73, Fig. 7.
Swanton, Pl. 42, Figs. 3-5, 1909.

PILEUS 1-3 cm. broad, convex then plane, umbilicate or depressed, *bluish-black to jet-black when young,* becoming smoky-fuscous when old, *becoming minutely squamulose* by the breaking up of the cuticle, innately-fibrillose at first, squamules dense in center, *never striate,* not papillate, sometimes rimose, margin decurved then raised. FLESH at first bluish-black, then gray to white, subhygrophanous, thin. GILLS adnate-seceding, moderately broad, subdistant, *ventricose,* white at first *then rose-colored,* edge entire and concolor. STEM 2.5-5 cm. long, 1-3 mm. thick, equal or tapering upward, stuffed then hollow, often compressed and grooved, straight or curved, *glabrous,* even, firm, elastic, *bluish-black at first, becoming fuscous,* white mycelioid at base, apex not punctate. SPORES variable in size, tuberculate, angular, 9-13 x 6-7 micr., *rosy in mass.* CYSTIDIA none. ODOR and TASTE none.

Gregarious. On the ground, wet places in mixed hemlock and maple woods. Bay View, New Richmond, Marquette. July-September. Frequent in conifer regions.

Easily known by its bluish-black color when young, the lack of striations on the pileus and the rather firm stem. It approaches *L. asprella,* and I at first referred it to that species, but the margin of the pileus is never striate and the gills are not gray. It has the colors of *L. serrulata* but the edge of the gills does not become black-dotted. The figures of European authors do not illustrate our plant well; this is not surprising, since it is always reported as growing "among grass." In fact, the majority of species in England are reported from grassy places, while with us the high winds and dryer conditions seldom favor their appearance in fields or meadows, and the forest forms are slightly different in appearance. It agrees well with the description of Fries given in his Monographia. Ricken gives broader spores; those of our plants agree with the size given by Saccardo.

616. Leptonia rosea Longyear

Mich. Acad. of Sci. Rep. 3, 1902.

Illustrations: Ibid, Plate I, Fig. 5.
Plate CXIV of this Report.

PILEUS 1.5-3.5 cm. broad, convex, then expanded, depressed or subumbilicate at center, *not striate, rose color when young,* fading to isabelline with reddish umbilicus, minutely fibrillose-scaly, especially at center. FLESH thin, white. GILLS adnate with slight tooth, close, moderately broad, ventricose, broadest behind, *white then flesh color.* STEM 5-8 cm. long, *slender,* scarcely 1.5 mm. thick, *equal,* cartilaginous, glabrous, *stuffed,* appearing solid, *pale roseate,* white-mycelioid at base, subpellucid-striatulate. SPORES angular, 10-12 x 7-8 micr., flesh color in mass.

Scattered. On sphagnum, in cedar and tamarack swamp (35 specimens). Bay View. "Burnt ground on a sandy hillside, Kent County. Longyear." July-September. Rarely seen.

The difference in habitat of the two localities where this has been found is remarkable. My own collection was made entirely on thick sphagnum, but Longyear found the two type specimens on burnt-over sandy soil. Its pretty colors are attractive and it is not easily mistaken. Gillet's figure of *Nolanea rufocarnea* Berk. reminds one somewhat of *L. rosea,* but our species is a true Leptonia with a non-striate pileus, without the bitter taste of *N. rufocarnea* and with a different color.

617. Leptonia seticeps Atk.

Jour. of Mycol., Vol. 8, 1902.

PILEUS 1-3 cm. broad, convex to expanded, umber to brownish-gray, darker on disk, *faintly and finely long-striate,* minutely granulose under a lens, margin somewhat incurved at first. FLESH whitish, very thin, composed of two layers, surface layer of oval or clavate long-pediceled cells mixed with longer, lanceolate to fusoid cells, all with smoky content. GILLS *slightly adnexed* or free, subdistant to close, broad, elliptical, white then flesh color, edge eroded; the trama composed of converging hyphae. STEM short, 1-2 cm. long, 2-3 mm. thick, glabrous or sometimes villose-dotted, whitish or brownish, subcartilaginous, solid, fibrous-striate, equal or bulbilose, straight or curved, sometimes slightly eccentric.

SPORES broadly-elliptical to subglobose, *not angular,* minute, 6-7 x 5-6 micr. in diameter, pale flesh color in mass. CYSTIDIA more or less numerous on the edge of the gills, clavate to elliptical, sometimes hair-pointed, hyaline, 50-60 x 10-15 micr. ODOR and TASTE not marked.

Scattered. On rotten logs. Bay View, Houghton, Ann Arbor. July-September. Frequent in hemlock or tamarack woods, mixed with maple or birch.

This little Leptonia is partial to rotten wood. Its finely striate, granulose pileus reminds one of some of the small species of Pluteus and it approaches that genus also in its smooth spores and clavate cystidia. The gills are slightly adnexed or, in expanded specimens, they may be free, and the stem is subcartilaginous. It seems to form a connecting link between Leptonia and Pluteus.

***Gills yellowish-tinged.*

618. Leptonia formosa Fr.

Syst. Mycol., 1821.

Illustration: Fries, Icones, Pl. 98.

PILEUS 1-3 cm. broad, convex then plane and umbilicate, *yellow-wax color,* covered with minute fuscous squamules, *margin striate.* FLESH thin, yellow, toughish, membranaceous. GILLS adnate, with a tooth, *rather broad,* subdistant, *tinged yellow* then flesh color, edge entire, concolor. STEM 4-5 cm. long, 1.5-2 mm. thick, strict, equal, cartilaginous, stuffed then hollow, *yellow,* glabrous, shining, *striatulate.* SPORES tuberculate-angular, rather rectangular in outline, 10-12 x 6-7 micr., apiculus oblique, flesh color. CYSTIDIA none. ODOR and TASTE mild.

Scattered. In low, swampy woods of hemlock, etc., in northern Michigan, in maple and elm woods in southern Michigan. July-September. Throughout the State. Frequent locally.

Easily recognized by the yellow cast to the whole plant and the striate and squamulose pileus. Fries says "scarcely different from *L. asprella* except in color." This is borne out by the fact that it is subhygrophanous, which makes it difficult to place not only this but other swamp species in the non-hygrophanous section.

***Gills bluish or blackish at first.*

619. Leptonia serrulata Fr.

Syst. Mycol., 1821.

Illustrations: Hard, Mushrooms, Fig. 207, p. 254, 1908.
Gillet, Champignons de France, No. 437.

PILEUS 1-3 cm. broad, convex then plane, umbilicate-depressed, *not striate, at first bluish-black*, then smoky-umber or fuscous squamulose, especially in the umbilicus. FLESH thin, not hygrophanous, whitish. GILLS adnate, white, tinged bluish-gray, *edge black-serrulate,* ventricose. STEM 2-5 cm. long, 1-2 mm. thick, cartilaginous, *blackish to steel-blue*, stuffed then hollow, rigid, equal, *glabrous, except the black-dotted apex,* white-mycelioid at base. SPORES 11-4 x 7-8 micr., tuberculate-angular, elongated. *Sterile cells* on the edge of the gills, filled with blackish coloring matter.

Scattered or gregarious. In low wet places, of mixed hemlock woods in the north; ash, elm and maple woods of southern Michigan.

Throughout the State. July-September. Frequent locally.

This species and *Eccilia atrides* appear to run into each other. Both are characterized by the black-serrulate edge of the gills. In Eccilia they run down the stem by a broad tooth. The colors remind one much of *L. lampropoda,* which differs mainly in that it has not black-edged gills and is not black-dotted at the apex of the stem. Varieties and related species have been described, indicating that these two species run into each other. Var. *expallens* Fr. is *paler;* var. *laevipes* Maire has no black dots on the stem; var. *berkeleyi* Maire has entire gills.

620. Leptonia euchroa Fr.

Syst. Mycol., 1821.

Illustration: Cooke, Ill., Pl. 334.

PILEUS 1-2 cm. broad, convex then plane, not umbonate nor truly umbilicate, *covered with fibrillose squamules, violaceous to wine-color,* not striate, margin fibrillose-scaly. GILLS subdistant, *very ventricose*, narrowed at both ends, narrowly adnate, sometimes pseudo-decurrent when pileus is expanded, *violet at first then pallid.* STEM slender, equal, 2-3 cm. long, 2 mm. thick, stuffed then hollow,

toughish, *glabrous* or very delicately fibrillose with *purple fibrils on a dark violet ground.* SPORES tuberculate-angular, elongated, 10-12 x 6-7 micr. (occasionally wider), angles obtuse. CYSTIDIA none.

Subcaespitose. On sawdust, rotten wood, etc. Bay View. July-August. Rare.

This beautiful little plant is a wood-inhabiting species like *L. placida* but much more slender. The spores of our plants are longer than the measurements given by the English mycologists and their coarse obtuse angles make them somewhat unique. When old, the translucent margin of the pileus shows the lines of the gills so as to appear striate, a condition often found in other non-striate species when old.

Section II. Hygrophanae. Pileus hygrophanous, margin striate when fresh and moist.

621. Leptonia asprella Fr.

Syst. Mycol., 1821.

Illustration: Atkinson, Mushrooms, Fig. 139, p. 147, 1900.

PILEUS 2-4 cm. broad, convex, becoming somewhat expanded, umbilicate-depressed, *glabrous or fibrillose, striatulate when moist,* umbilicus villose or scaly, *hygrophanous,* silky-shining when dry, from pale umber to grayish-brown, variable in color, margin becoming split. FLESH watery to whitish, thin, rather fragile. GILLS adnexed to adnate seceding, *subdistant, rather broad, narrowed in front,* whitish to grayish, then rosy from the spores, edge concolor, entire. STEM 3-8 cm. long, 2-3 mm. thick, slender and usually straight, rigid and elastic but fragile, *glabrous,* livid-fuscous to pale, stuffed then hollow, sometimes twisted, white-mycelioid at base, apex pruinose. SPORES angular, angles sharp, 9-13 x 6-8 micr., broadly elliptic-elongate in outline. CYSTIDIA none. ODOR and TASTE mild.

Solitary or gregarious. On the ground in woods. Bay View, New Richmond, Ann Arbor. Infrequent. August-September.

This species varies considerably, and there seems to be no settled notion of its exact limitations. Cooke figures a plant quite different in color and size from that of the above description. The striations are not always definitely present, especially in the dry plant. The

spores are variable in size, even in the same plant. One variety occurs in low, mossy or sphagnous places. Its pileus is pale isabelline or pale brownish-gray when moist, slightly virgate with fibrils, scarcely or not at all striatulate. The gills are white at first. The stem is of the same color or is slightly paler than the pileus, so that the whole plant has a uniform color when fresh and mature. The cap is apt to be truncate at the apex and campanulate; in all other respects it agrees with the species. *L. asprella* is found in coniferous regions, e. g., Bay View, New Richmond. See Ricken's figure of *L. anatina,* Pl. 73, Fig. 9. That species, however, has markedly narrow gills.

Nolanea Fr.

(From Latin, *Nola*, a little bell.)

Pink-spored. Stem *hollow* and cartilaginous or tough, usually slender. Gills adnate, adnexed or almost free, seceding, not decurrent. Pileus thin, *campanulate,* usually *papillate,* margin at first straight and applied to the stem. Spores *angular.*

Terrestrial, small, slender plants, corresponding to Mycena of the white-spored group, approaching the smaller Entolomas, and separated from Leptonia by the unexpanded bell-shaped pileus. It is a small genus.

The PILEUS is glabrous, silky or scurfy, dry or hygrophanous; and its campanulate shape which is rather persistent and is due to the position of the straight margin on the stem when young, is quite characteristic. It is usually fragile. The color is some shade of brown in our species except in *N. caelestina.* The GILLS are often broad or ventricose, and generally secede (i. e. separate) from the attachment at the stem, in which respect they differ from those of Clitopilus. The STEM is central, tubular and elastic or fragile in most species; in some, however, it is toughish-cartilaginous like that of certain Mycenas. It has a tendency to become compressed or longitudinally furrowed because of its hollow interior. It is usually glabrous or minutely flocculose; in *N. dysthales* (Pk.) it is densely floccose-hairy. There is *no annulus, nor volva,* and the flesh is confluent with that of the pileus. The SPORES are angular, often irregularly tuberculate-angular. CYSTIDIA are usually absent; in *N. babingtonii* and *N. dysthales* they may be found on the edge of the gills. A few species have a slight ODOR; that of *N. mammosa* is similar to rancid meal. The Nolaneas are difficult

to identify to the species, and a microscope is essential to any final decision.

Key to the Species

(a) Pileus and stem lavender to violaceous. 630. *N. caelestina* var. *violacea* Kauff.
(aa) Pileus and stem some other color.
(b) Spores quadrate or cruciate-four-angled; pileus umber or smoky-umber. 623. *N. pascua* Fr.
(bb) Spores not distinctly four-angled.
(c) Pileus with greenish tint, fuscous-brownish, livid or smoky, very shining. 624. *N. versatilis* Fr.
(cc) Pileus without greenish or olivaceous tints.
(d) Stem and pileus hairy, fibrillose-scaly or flocculose; gills subdistant.
(e) Spores 14-20 x 8-9 micr.; whole plant smoky-brown. 622. *N. dysthales* (Pk.) Atk.
(ee) Spores subglobose, 8-9 micr.; pileus small, covered with loose brown fibrils. 625. *N. babingtonia* Berk.
(dd) Stem and pileus glabrous, silky and shining.
(e) Gills white or whitish at first; pileus hygrophanous.
(f) Pileus conical, cinnamon-brown then pale and shining; gills narrow. 628. *N. conica* Pk.
(ff) Pileus campanulate, grayish-brown; gills medium broad. 629. *N. fuscogrisella* Pk.
(ee) Gills grayish at first; odor somewhat rancid-farinaceous. 626. *N. mammosa* Fr. 627. *N. papillata* Bres.

**Gills at first gray, brown or fuscous.*

622. Nolanea dysthales (Pk.) Atk.

N. Y. State Mus. Report. 32, 1879 (as *Entoloma dysthales*).
Jour. of Mycol., Vol. 8, p. 114, 1902 (as *Nolanea nodospora* Atk.).

PILEUS 6-18 mm. broad, rarely larger, thin, campanulate-convex, obtuse, densely floccose-hairy, sometimes furfuraceous and striate, more often even, the hairy tufts sometimes squarrose, *smoky-umber or dark fuscous*, margin at first straight. FLESH submembranous. GILLS adnate, ascending, *broad*, ventricose, subdistant to distant, thickish, dark fuscous-gray or smoky, tinged flesh color at maturity, edge flocculose. STEM 1-4 cm. long, 1.5-4 mm. thick, equal, more or less densely *floccose-tomentose, dark fuscous* or seal-brown, becoming smoky, toughish-cartilaginous, stuffed then hollow, concolor within. SPORES large, variable, *elongated tuberculate-angular*, 14-20 x 8-9 micr., deep flesh color in mass, faintly colored under the microscope. CYSTIDIA only on edge of gills, *variable*, sometimes elliptical to ventricose and obtuse, sometimes ventricose-lanceolate and pointed, 60-70 x 20-25 micr. ODOR and TASTE mild.

Solitary or scattered. On low, wet, mossy or swampy ground, on leaf mold, etc., in hemlock regions. Bay View, South Haven, New Richmond. July-September. Infrequent.

This species is known by the covering of the cap and stem, its color and the very large tuberculate spores. It is very variable and was considered an Entoloma by Peck, who first described the form with the thin, striate pileus whose surface is only granular-furfuraceous or mixed with the characteristic hairs. Later Atkinson described the form in which the hairy covering is more highly developed, often as if matted, as *Nolanea nodospora*. I have found the two forms in different parts of the state and consider them variations of the same plant. The trama of the pileus is two-layered, the layers being separated by a dark line of narrow hyphae. A form occurs in frondose woods, of which the hair-like fibrils of the stem are almost ferruginous. The gills of *N. dysthales* remain dark grayish-brown a long time and hence it is easily mistaken for an Inocybe; at length, however, they are somewhat colored by the rather bright spores. It seems that in very moist situations the cap is less hairy-scaly and then striate, especially when more fully expanded. The size of the basidia varies as the plant slowly matures and the cystidia seem to take on a different shape in age.

623. Nolanea pascua Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 376.
Gillet, Champignons de France, No. 493.
Ricken, Blätterpilze, Pl. 74, Fig. 3.
Swanton, Fungi, Pl. 42, Fig. 10-12.

PILEUS 2-4 cm. broad, *fragile, conico-campanulate*, obtuse or umbonate, hygrophanous, umber-brown and striatulate (moist), fading and even (dry), glabrous, silky-shining. FLESH thin, concolor. GILLS rounded behind, adnexed, rather broad, *ventricose*, grayish, then gray-flesh color, seceding, close. STEM 4-10 cm. long, 2-4 mm. thick, pallid grayish-brown, cartilaginous, hollow, equal, often twisted, *fragile*, splitting longitudinally, fibrillose-striate. SPORES *subquadrate or almost cruciform*, 8-11 micr. diam., deep flesh color in mass. CYSTIDIA none; sterile cells absent on edge of gills.

Gregarious. On low mossy ground in open woods by lakes. Ann Arbor. September. Infrequent.

This species is said to be very common in Europe. I have only one record and the specimens are lost. It was most sharply marked by the quadrate, 4-angled spores. This is a character given by nearly all authors and by the figures. Our plants approached closely *N. staurospora* Bres. (Fung. Trid., Vol. I, p. 18), and this species and *N. pascua* (sense of Ricken) seem to be very similar. It certainly is not a common species with us and I did not observe any olive tints, such as occur in our *N. versatilis.*

624. Nolanea versatilis Fr.

Monographia, 1863.

Illustrations: Fries, Icones, Pl. 98, Fig. 5.
Ricken, Blätterpilze, Pl. 74, Fig. 7.
Plate CXV of this Report.

PILEUS 1-3 cm. broad, at first conic or elongated-oval, then campanulate, fragile, obtuse, at length expanded and subumbonate, silky-shining, sometimes *silky-fibrillose, almost glittering,* color variable, livid-fuscous, olivaceous-brown, smoky-tinged, subhygrophanous. FLESH thin, submembranous, grayish. GILLS narrowly adnexed, almost free, ventricose and *broad in front,* subdistant, *gray,* becoming smoky-flesh color, edge minutely fimbriate. STEM 3-6 cm. long, 1-4 mm. thick, equal, hollow, *often twisted or compressed,* splitting longitudinally, fibrillose-striate, *shining,* glabrous or flocculose, pallid then pale fuliginous or fuscous. SPORES tuberculate-angular, longer than wide, 9-11 x 6-7.5 micr. (few longer), flesh color in mass. CYSTIDIA numerous on edge of gills, few elsewhere, ventricose, often acuminate-pointed, 45-65 x 12-16 micr. ODOR and TASTE slight or none.

Gregarious. Among grass in low moist woods. Ann Arbor, New Richmond. July-August. Infrequent.

This species was abundant in a single wood-lot during one season; elsewhere it occurred as few individuals. It varies in size and shape (within limits); often it has the shape and size of Cooke's figures of *N. pascua,* at other times the caps may be narrow and stem slender and longer, all in the same patch. The cap is beautifully silky and shining and usually has a somewhat olive or greenish hue which suggests the glitter of metal. The shape of the young plant is often like that of *Hygrophorus conicus* or of an Inocybe. In our specimens the stem was frequently somewhat flocculose.

Except for the spores it approaches *N. pascua* quite closely in color and shape. It is here conceived in the sense of Rickeh.

625. **Nolanea babingtonii** Berk.

Outlines of British Fungology, 1860.

Illustrations: Patouillard, Tab. Analyt., No. 429.
Cooke, Ill., Pl. 377.

"Pileus 6-12 mm. broad, conico-campanulate, pale gray, *covered with dark brown fasciculate fibrils free at one end,* silky-shining, disk subsquamulose. FLESH very thin. GILLS adnate, *distant,* gray, ventricose, edge minutely flocculose. STEM 2-3 cm. long, 2 mm. thick, equal, *covered with dark-brown down,* hollow, slightly undulate. SPORES angular-nodulose, subglobose or slightly oblong, 7-8 micr., apiculate."

Lewiston. On moss, in wet places. Rare. Reported by Longyear.

The description is taken from Massee's British Fungus Flora, and the spore-measurements were doubtless made from the type specimen. Patouillard gives spore size as 9-10 x 5-6 micr. It is a delicate little plant, characterized by the loose fibrils which stand out from its pileus and stem. There is some doubt of this determination.

626. **Nolanea mammosa** Fr. (Sense of Bresadola.)

Epicrisis, 1836.

Illustrations: Bresadola, Fung. Trid., Vol. I, Tab. 82, 1881.
Gillet, Champignons de France, No. 491.

PILEUS 2-4 cm. broad, conic to broadly campanulate, margin decurved, *mammilately umbonate,* faintly striate, umber (moist), soon grayish-brown or fuscous, innately fibrillose and shining when dry. FLESH dingy, brownish near surface, thin, subscissile. GILLS rather broad, rounded behind, usually narrowly adnate but seceding, *subdistant,* thickish, *pale gray at first* then tinged flesh color by spores, edge often uneven. STEM 5-9 cm. long, elongated, 2-5 mm. thick, tubular, terete or compressed, *tinged fuscous,* not white, cartilaginous, slightly fibrillose-striate, *white-pruinose at apex,* otherwise glabrous. SPORES tuberculate-angular, elongate, distinctly longer than broad, 9-11 x 6-7 micr., deep flesh color, nucleate. CYSTIDIA none. ODOR and TASTE of rancid meal.

(Dried: Gills pale brown.)

Gregarious. On the ground in woods, copses, etc., sometimes in grassy places. Throughout the State. July-October. Frequent.

This is our commonest Nolanea. It may be known by its elongated stem which is often furrowed longitudinally, by its gray gills and by the spores; the latter are distinctly longer than broad, and the angles are not as clearly and sharply marked as in other species. It is somewhat hygrophanous. The gills are often broadly adnate. There are short sterile cells on the edge of the gills.

627. **Nolanea papillata** Bres.

Fungi Tridentini, Vol. I, 1881.

Illustrations: Ibid, Pl. 82.
Fries, Icones, Pl. 98, Fig. 4 (as *Nolanea mammosa* var. *minor* Fr.).

PILEUS 2-3 cm. broad, campanulate, *then expanded, papillate,* umber to watery-brown and striate (moist), paler when dry, glabrous. FLESH thin, scissile, subhygrophanous, fragile. GILLS sinuate-adnate, seceding, broader toward front, subdistant to close, subventricose, livid-whitish then somewhat salmon-colored from spores. STEM *slender,* 3-5 cm. long, 1-2 mm. thick, tubular, pale grayish-brown, glabrous, slightly pruinose at apex, white-mycelioid at base, straight or curved, cartilaginous, sometimes striatulate. SPORES angular, 9-11 x 6-7 micr., nucleate, salmon-colored in mass. ODOR none or slightly of rancid meal. CYSTIDIA none.

Scattered. Low places in moist frondose woods. Ann Arbor, Bay View, New Richmond. September. Infrequent.

Differs mainly from *N. mammosa* in its more slender habit, smaller size and closer gills.

***Gills white at first.*

628. **Nolanea conica** Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 5-15 mm. broad, *conical,* then expanded and papillate, *hygrophanous,* watery-cinnamon and striatulate (moist), paler, silky-shining and subzonate (dry). FLESH thin. GILLS nearly free, close, moderately broad, narrowed behind, white at first, *bright flesh color* from spores. STEM slender, 2-5 cm. long, 1-2 mm. thick,

equal, straight, tubular, cartilaginous, elastic, white-mycelioid at base, tinged ashy-brown. SPORES tuberculate-angular, 7-9 (including apiculus) x 5-6 micr., longer than broad, *apiculus prominent*. CYSTIDIA none.

Solitary or scattered. On moss or low places in swamps or wet conifer or mixed woods. Northern Michigan. July-September. Infrequent.

The conical, shining, hygrophanous pileus and small spores distinguish it. The length of spores rarely passes 8 microns unless apiculus is included.

629. Nolanea fuscogrisella Pk.

N. Y. State Mus. Rep. 39, 1886.

PILEUS 1-2.5 cm. broad, campanulate, more or less palillate, *hygrophanous*, glabrous, grayish-brown and striatulate (moist), paler and silky-shining (dry), papilla darker. GILLS rather broad, narrowed behind, adnexed, almost subdistant, whitish then bright flesh-colored. STEM 5-7 cm. long, 2-4 mm. thick, glabrous, white-mycelioid toward base, apex pruinose, *brownish*, often darker than pileus, tubular, cartilaginous. SPORES 7-9 x 5-6 micr. (incl. apiculus), angular, apiculus prominent.

Gregarious. On moss, etc., of low mixed woods. Sault Ste. Marie. July. Infrequent.

This differs from the preceding in its stouter stem, and less conic pileus. The spores are very similar. The gills are broader. In our specimens the stem was invariably darker than the pileus, and hoary at base and above by the white mycelium. The spores are slightly shorter than the measurements given by Peck.

630. Nolanea caelestina var. violacea Kauff.

Mich. Acad. Sci. Rep. 10, 1908.

PILEUS 8-10 mm. broad, *conico-campanulate*, *lavender*, acutely papillate, innately silky-fibrillose, margin even. GILLS adnexed, rather narrow, *subdistant*, white then flesh color, not reaching to the margin of pileus. STEM slender, 5 cm. long, 1 mm. thick, even, glabrous, pruinose at apex, equal, lavender, darker than cap. SPORES tuberculate-elliptical, 9-11 x 6-7 micr. CYSTIDIA none. ODOR none.

Solitary. In low elm swamp. Ann Arbor. Rare.

A beautiful little plant, usually hidden among the debris of the woods. The stem is flexible, subcartilaginous and does not turn reddish when bruised. It differs from the descriptions of the type in the narrow gills. It appears close also to *N. cruenta* Quel. except in color.

Eccilia Fr.

(From the Greek, *ekkoilo,* I hollow out.)

Pink-spored. Stem *cartilaginous,* hollow or stuffed, slender. Gills *decurrent,* either attenuated behind or broadly adnato-decurrent. Pileus *umbilicate* or depressed, its margin at first incurved. Spores *angular.*

Terrestrial or lignicolous. Small, slender plants, corresponding to Omphalia of the white-spored group; differing from the small Clitopili in the cartilaginous stem. A very small genus composed of rather rare species.

The PILEUS is glabrous, silky, or somewhat squamulose in the umbilicus; dry or hygrophanous. It is usually expanded and then the center is depressed to strongly umbilicate. Its margin is at first incurved and this character may persist until maturity. The color varies from white to grayish and brown. The GILLS are attached in two ways, either attenuate-long-decurrent or broadly adnate and then slightly decurrent, remaining attached, i. e., not seceding as a rule. They are often quite distant as in *E. rhodocylix* Fr. or crowded as in *E. atrides Fr.* and *E. polita Fr.* They vary from narrow in some species to broadly triangular in others. In *E. apiculata* Fr., *E. vilis* Fr. and *E. rhodcylicioides* Atk. they are distinctly gray; in others, white or dingy white, finally colored by the spores. Some species possess cystidia, giving the edge a minutely fimbriate appearance. The STEM is usually enlarged somewhat at the apex where it expands into the membranaceous pileus. It is truly cartilaginous, slender, and soon hollow or tubular within. Some species have been described as solid, but it remains to be seen whether these are not really only stuffed at first by a differentiated pith. The color is often that of the pileus or paler. The angular SPORES correspond to those of Leptonia, Nolanea, Pluteus and one of the sections of Clitopilus. CYSTIDIA usually absent; in *E. pirinoides, E. rhodcylicioides* Atk. and *E. roseoalbocitrina* Atk. cystidia-like cells are present on the edge of gills.

The group is difficult, and the rarity of specimens makes it hard to learn much concerning their variability. A microscopic study is essential to determine the species with any satisfaction, as the size of spores and basidia, the structure of the trama, and the presence or absence of cystidia must often determine the final judgment.

Because of their rare occurrence, it seems best to include in the key all forms which may possibly be found in the State. *E. polita* and *E. carneo-grisea* have been reported from the neighboring States.

Key to the Species

(a) Gills crowded or close.
  (b) Edge of gills black-dotted. 631. *E. atrides* Fr.
  (bb) Edge of gills concolor, not black dotted.
    (c) Pileus 2-4 cm. broad, hygrophanous, livid (moist); gills very crowded, broad. *E. polita* Fr.
    (cc) Pileus 5-20 mm. broad, not hygrophanous, mouse-gray; gills close, broad; spores 5-angled, 8-10 micr. 634. *E. pentagonospora* Atk. var.
(aa) Gills subdistant to distant.
  (b) Pileus 2-5 cm. broad, hygrophanous, tough, sordid-brown; stem tough, concolor; taste tardily pungent; gills close to subdistant; on the ground. 635. *E. mordax* Atk.
  (bb) Pileus smaller (rarely as large in *E. carneo-grisea*).
    (c) On wood; pileus deeply umbilicate, 1-1.5 cm., hygrophanous; gills very distant, broad, long-decurrent. *E. rhodocylix* Fr.
    (cc) Not on logs, stumps or wood.
      (d) On sphagnum; pileus umbonate, small, dark-brown; gills long-decurrent, distant, broad. Spores 10-12.5 x 6-7.5 micr. *E. sphagnicola* Pk.
      (dd) On lawns, fields, or in woods on humus, etc.
        (e) Pileus white, 1-2.5 cm., silky; gills adnato-decurrent, subdistant; stem long, white. Spores elongate, 9-11 x 6-9 micr. *E. roseoalbocitrina* Atk.
        (ee) Pileus grayish-brown to fuscous.
          (f) Pileus hygrophanous; gills without cystidia.
            (g) Edge of gills darker, crisped; pileus gray flesh color, margin micaceous; gills distant, spores 6-7 x 4-5 micr. *E. carneo-grisea* B. & Br.
            (gg) Edge of gills concolor; pileus brownish-gray (moist); gills subdistant, broad. 632. *E. grisco-rubella* Fr.
          (ff) Pileus not hygrophanous; gills with cystidia.
            (g) Gills adnato-decurrent, broad behind, distant; spores sphoeroid, angles not sharply marked. 633. *E. pirinoides* sp. nov.
            (gg) Gills arcuate, distant, decurrent; spores prominently angled, quadrate. *E. rhodocyliciodes* Atk.

Illustrations:

E. vilis Fr.: Ricken, Blätterpilze, Pl. 73, Fig. 10.

E. carneo-grisea Fr.: Hard, Mushrooms, Fig. 205, 1908.

E. parkensis Fr.: Icones, Pl. 100, Fig. 5.

E. polita Fr.: Atkinson, Mushrooms, Fig. 140, 1900.
Fries, Icones, Pl. 100, Fig. 3. Hard, Mushrooms, Fog. 206, 1908.

E. rusticoides Gill.: Ricken, Blätterpilze, Pl. 73, Fig. 11.
E. rhodocaylix Fr.: Swanton, Fungi, Pl. 42, 1909. Fries, Icones, Pl. 100. Fig. 6.
E. sphagnicola Pk.: N. Y. Mus. Rep. 54, Pl. 1, 1900.

631. Eccilia atrides Fr.

Epicrisis, 1836.

PILEUS 1-2 cm. broad, deeply umbilicate, dark *umber,* umbilicus darker, striate to umbilicus, somewhat virgate, pruinose. FLESH thin. GILLS decurrent, narrowed behind, close, pallid, *edge black.* STEM 2-3 cm. long, 1-2 mm. thick, brownish, apex paler and floccose-dotted, dots sometimes black, sometimes pallid, hollow, glabrous below, equal and slender. SPORES tuberculate-angular, elongated, 11-13 x 6-7 micr. (incl. apiculus), bright flesh color in mass.

Solitary or gregarious. On very rotten wood. Houghton, Bay View. July-August. Infrequent in maple and hemlock woods of northern Michigan.

This species approaches *Leptonia serrulata* Fr. which also has black-edged gills. At times this character is almost or entirely absent except in old plants. Our plants had truly decurrent gills, but not extending far down the stem. It is usually found on debris or on very rotten logs in forests. Ricken considers it identical with *L. serrulata.*

632. Eccilia griseo-rubella Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 100, Fig. 4.
Gillet, Champignons de France, No. 568.
Cooke, Ill., Pl. 613.

PILEUS 1-2.5 cm. broad, campanulate, umbilicate, hygrophanous, striate and brownish-ashy (moist), umbilicus darker, minutely squamulose, *elsewhere with innate white fibrils.* FLESH concolor, thin. GILLS *broadly adnate,* slightly decurrent, broad, subdistant, pallid then flesh color, edge even. STEM 2-4 cm. long, 1-2 mm. thick, pallid to buff, *glabrous,* equal, even, cartilaginous, hollow. SPORES tuberculate-angular, elongated, 8-9 x 5-6 micr.

Solitary or scattered. On the ground in cedar swamps. Bay View. September. Infrequent.

Our plant has rather broad gills as is shown in Fries' Icones. The other authors figure narrower gills. The pileus becomes hygrophanous-streaked on drying.

633. Eccilia pirinoides sp. nov.

PILEUS 1-2 cm. broad, campanulate, then subexpanded, margin decurved, depressed-umbilicate, grayish-brown to fuscous, moist, silky shining when dry, *with dense appressed small squamules on disk*, appressed-fibrillose elsewhere. GILLS adnato-decurrent, *broad behind, subdistant,* thin, whitish then rosy-tinged to bright flesh-color. STEM 4-6 cm. long, 1-2.5 mm. thick, distinctly cartilaginous, white, slightly fuscescent, pruinate, equal, even, stuffed with a white pith, finally hollow. SPORES sphoeroid-subangular, angles not prominent, 8-10 micr. diam. (without apiculus), *abruptly narrowed to an apiculus which is 2-3 micr. long,* obscurely 5-6 sided. CYSTIDIA not numerous, slender, acuminate, about 75 micr. long. BASIDIA 4-spored, clavate, 45-50 micr. long. ODOR none.

Gregarious. On the ground, among forest debris, hemlock, oak and maple woods; clay ravine. September. New Richmond.

Except for its lack of a strong malic odor, it agrees with all the descriptions which we have of *E. pirina* B. & C. It also approaches *E. rhodocylicioides* Atk.; but it differs from the latter in its bright colored spores, even pileus and broadly adnate, white gills; the shape of the spores is also different. It has so far been found only in one locality.

634. Eccilia pentagonospora Atk. var.

Jour. of Mycol., Vol. 8, p. 113, 1902.

PILEUS 5-20 mm. broad, fragile, convex-plane, umbilicate, hygrophanous, *at first blackish-gray, fading to steel-gray and shining,* even, at first minutely tomentose-flocculose over the entire surface, later appressed scurfy. FLESH thin, membranous. GILLS broad behind and *adnate-subdecurrent*, at first grayish then dark flesh color, close to subdistant, thickish, somewhat crisped, edge concolor. STEM 1-2.5 cm. long, 1-1.5 mm. thick, equal, hollow, entirely *glabrous,* cartilaginous, *metallic gray,* whitish-mycelioid at base. SPORES tuberculate-angular, mostly 5-angled, angles obtuse, 7-9.5 micr. (incl. apiculus), deep flesh color in mass. CYSTIDIA none. BASIDIA about 30 x 9-10 micr.

Gregarious. On moist soil in frondose woods. Ann Arbor. August.

This collection departs from Atkinson's description in the more flocculose, hygrophanous pileus and the hollow stem. The microscopic characters seem to be the same.

635. Eccilia mordax Atk.

Jour. of Mycol., Vol. 8, p. 113, 1902.

PILEUS 2-5 cm. broad, convex, *tough,* umbilicate, hygrophanous, glabrous, *dull-reddish-brown to pale chestnut or cinnamon (moist),* sordid isabelline (dry), even, margin inrolled. FLESH dirty white, thin. GILLS adnate to subdecurrent, close, *dingy brown at first* then tinged flesh color, narrow. STEM 3-6 cm. long, 3-5 mm. thick, *tough,* equal, fibrous-cartilaginous, fistulose, often compressed, *concolor,* glabrous or pruinose, white mycelioid at base. SPORES oval, 6-7 x 4-5 micr., smooth, pale flesh color. CYSTIDIA none. BASIDIA clavate, 25-30 x 6-8 micr., 4-spored. TASTE at first mild, after 15-20 minutes pungent in the throat and causes nausea.

Gregarious. On the ground, springy sides of ravines. Ann Arbor. August. Infrequent.

This species approaches *Clitocybe cyathiforme* in external appearance, but differs by its flesh-colored spores, its umbilicate pileus and the habitat on the ground. It seems to be our largest Eccilia and is probably somewhat poisonous.

Claudopus Smith.

(From the Latin, *claudus,* defective, and *pes,* foot.)

Pink-spored. Stem *eccentric, lateral or wanting.* Pileus dimidiate or resupinate, irregular. Gills not seceding nor anastomosing, radiating from an eccentric or lateral point. Spores angular or rounded.

On rotten wood or humus. Corresponding to the genus Pleurotus of the white-spored group. With the exception of *C. nidulans,* they are small, insignificant, soft plants, often growing in small hollows of decayed wood or on humus at the base of stumps, etc. The small forms are white, grayish or brown; *C. nidulans* is *yellow to buff.* All except one of the small species are at first resupinate, i. e., applied to the substratum with gills uppermost, but finally

becoming reflexed with gills in the usual position. The stem is entirely lacking or is small and inconspicuous, usually tomentose or villose at the point of attachment of the stem or pileus. Only a few species are known in our flora.

Key to the Species

(a) Pileus medium to large, yellowish; gills orange yellow. 636. *C. nidulans* Fr.
(aa) Pileus small, 3 cm. or less in diam.; not yellow.
(b) Pileus white or whitish, at first resupinate.
(c) Spores angular; pileus silky to villose-floccose. 637. *C. depluens* Fr.
(cc) Spores not angular; pileus tomentose. *C. variabilis* Fr.
(bb) Pileus gray to brown.
(c) Pileus hygrophanous, striatulate (moist); gills scarcely reaching stem. *C. griegensis* Pk.
(cc) Pileus not hygrophanous, subdecurrent. 638. *C. byssisedus* Fr.

636. Claudopus nidulans Fr.

Syst. Mycol., 1821. (As Pleurotus.)

Illustrations: Atkinson, Mushrooms, Pl. 41, Fig. 141, p. 149, 1900.
Hard, Mushrooms, Fig. 208, p. 256, 1908.
Clements, Minn. Mushrooms, Fig. 35, p. 59, 1910.
Plate CXV of this Report.

PILEUS 1-7 cm. broad, shelving, sessile or narrowed behind into a short stem-like base, nearly orbicular, dimidiate or reniform, *coarsely hairy or tomentose on the surface,* rich yellow or buff, margin at first involute, even. FLESH soft, rather tough. GILLS *orange-yellow,* medium broad, close to subdistant, adnate, rarely subdecurrent. STEM or attached base tomentose next to the gills beneath. SPORES elongated, slightly curved, 6-8 x 3-4 micr., smooth, *pink in mass.* ODOR *very disagreeable* when fresh. TASTE becomes rather mild at length; not desirable for the table.

Gregarious or imbricately caespitose. On decaying logs, etc., of frondose trees. Throughout the State; Marquette, Houghton, Ann Arbor, etc. July-October. Infrequent.

Panus dorsalis Bosc. is now agreed to be the same. The toughish consistency of *C. nidulans* approaches that of the genus Panus. In general appearance it looks like a Pleurotus and was so called by Fries, and as its spore-color is not a very bright pink it would seem to fit that genus as well as *Pleurotus subpalmatus* does. The latter, in my opinion, might equally well be made a species of the pink-

spored group. The beginner will be apt to refer *C. nidulans* to the ochre-spored group in Crepidotus if he neglects to make a spore-print. This all emphasizes the fact that nature takes no account of the convenience of the student and probably no system can ever be devised in which some plants will not be found half-way between the groups. This is the largest of the genus, and is not easily confused with other mushrooms except *Crepidotus dorsalis* which resembles it in colors but is smaller and has globose, ochre-brown spores. The pileus is more often dimidiate or kidney-shaped rather than the shape given in Atkinson's illustration.

637. Claudopus depluens Fr.

Syst. Mycol., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 431.
Cooke, Ill., Pl. 344.

PILEUS 1-5 mm. broad, *white,* resupinate at first then reflexed, suborbicular, subreniform, conchate, etc., *variable in form, floccose,* almost sessile or attached by a *short,* white, villose STEM. FLESH membranous, very thin. GILLS radiating from the stem, *broad,* subdistant to distant, rose-colored at maturity. SPORES *angular,* somewhat longer than broad, sphoeroid-angular from the end-view, 7-10 x 6-7.5 micr., distinctly rose-colored in mass, nucleate.

On very decaying wood or black humus, in hemlock and birch mixed woods, in springy places. New Richmond. September. Rarely found.

Massee gives the spores as sphoeroid; Patouillard and Peck give them slightly longer. It may be that varieties occur which might explain the difference. There was no tinge of red or gray present in our plants, as described by Fries. They are small and insignificant plants. *C. variabilis* is similar, but has non-angular spores. Ricken reports the above species under Crepidotus and with smooth spores.

638. Claudopus byssisedus Fr.

Syst. Mycol., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 432.
Cooke, Ill., Pl. 344.

"PILEUS 5-20 cm. broad, at first resupinate, then reflexed, near-

ly plane, reniform, covered with a fine pruinosity, gray tinged with pink, or grayish-brown, *striate on the margin.* FLESH thin, membranous. GILLS subdecurrent, grayish, rosy from the spores. STEM short, eccentric, or lateral, incurved, villose, *white fibrils radiating from the base* forming an interlaced membrane." SPORES elongate-angular, 9-11 x 6-7 micr., rosy in mass.

On very rotten wood. Swamps of frondose or conifer trees. Throughout the State. Summer. Infrequently found.

The description is taken from Fries and Patouillard. As in the preceding species, there is a difference in the spore-measurements given. Our plants have spores agreeing with those of Peck, while in Europe they seem to be smaller. Patouillard and Massee, give them 7-8 x 6 micr. The American form must, therefore, be considered as a variety. It is scarcely distinct from *C. griegensis* Pk.

LEUCOSPORAE

Amanita Fr.

(From the Greek *Amanos,* the name of a mountain in Asia Minor, which doubtless abounded in edible fungi, for the Roman physician Galen used the term Amanites to refer to *Agaricus campestris.* Persoon first applied it to this genus, using *Amanita caesarea* as the type.)

White-spored; stem provided with an *annulus* and a *volva,* and separable from the pileus. The gills are *free* or attached by a line, *white,* cut off squarely at anterior extremity. The volva is formed from a *universal veil* which covers the whole plant in the egg-stage and is *discrete* from the cuticle of the pileus. The hyphae of the trama of the gills are *divergent.*

Soft-fleshy, terrestrial, mostly *poisonous* mushrooms, usually of rather large size, never truly caespitose; mostly in forests or on the border of woods and thickets; sometimes, however, in fields or lawns.

The PILEUS is soft, entirely enveloped at the beginning, along with the stem, by a differentiated layer of tissue called the universal veil. When this splits above the pileus during the enlargement of the plant, it is pulled off from the pileus and leaves the surface of the pileus glabrous; when it splits circularly around the edge of the pileus (circumscissile) the loose layer left on top ceases to grow and as the pileus expands and enlarges, this covering is broken into patches or warts, sometimes called scales; if

the universal veil is of a powdery or loose consistency, it tends to disappear on the surface, or remains as floccose or mealy granules either irregularly disposed over the pileus or only on the margin; all intermediate arrangements occur when affected by the weather, as when rains wash off the scales, etc., or dry weather causes slow expansion and corresponding irregularities. The margin is markedly striate in some species like *A. caesarea* and *A. russuloides,* or striations may be entirely lacking as in *A. phalloides.* The shape of the pileus varies in the young stage, usually ovoid or spherical, sometimes campanulate or somewhat conical. Many species have the surface of the pileus, under the scales, provided with a delicate *viscid* pellicle, which causes fresh specimens when wrapped in tissue paper to adhere to the paper, and indicates one of the ways of recognition. The color of different species varies from pure snowy white to smoky brown, yellow, orange or bright red; bright green or blue colors do not occur in our species of this genus, olive, ashy to lead-color or livid-purplish being the only shades in this connection.

The GILLS are white or whitish, in some species tinged yellow. They are free from the stem, sometimes remote leaving an open space around its apex, sometimes reaching it by the narrowed point which may run down the stem as a line. Their shape varies, sometimes ventricose, often broader in front, sometimes almost equal in width except at stem; the anterior end is more or less sharply truncate, and this can be used to distinguish this genus and Amanitopsis from other Agarics even after cooking. Shorter gills alternate with those of full length. The trama of the gills is composed of hyphae which in this genus diverge toward the hymenium, instead of being noticeably parallel; in this respect it agrees with the genera Armillaria and Hygrophorus.

The STEM is usually soft; the interior is *stuffed by a pith* which is sometimes weblike and evanescent, sometimes forming a spongy column in the stem, and only disappearing at full maturity; in both cases the stem may become hollow. In *A. strobiliformis, A. solitaria* and *A. chlorinosma* the pith approaches the condition of solid stems, but all Amanitas have practically a form of stuffed stem. The texture of the stem is not homogeneous with that of the pileus and the apex separates rather easily from the pileus leaving a socket. It is cylindrical or tapers upward, the base enlarged in most cases into a bulb, but occasionally cylindrical throughout as in *A. spreta.* The base is enveloped in the volva which is found in various degrees of development or persistency and which can be

grouped under three heads: (1) The VOLVA is the remains of the whole universal veil which has split above the pileus and has formed a true cup or sheath at the base of the stem, the margin usually extends above the bulb or base. (2) The VOLVA in this case is only the lower half of the universal veil and adheres closely around the bulb, sometimes forming circular rolls or scaly rings on the lower part of the stem. (3) The VOLVA is very incomplete and fragmentary, floccose, mealy or minutely warty; this is due to the loose, friable texture of the universal veil, the remnants of which disappear easily when the stem is pulled from the soil. Thus the presence of a *volva* is not a safe or positive characteristic in case persons depend on the "death-cup" for their identification of the poisonous Amanitas. Besides the volva, the stem is provided with an ANNULUS. The annulus is sometimes formed from an outer layer of the stem. In the young, "button" stage the gills lie with their edges closely against and adnate to the stem, and during elongation of stem and expansion of pileus, this thin outer layer is pulled loose from the stem by the fact that it adheres more closely to the gills than to the stem. If it begins to tear off from the stem in the early stage of elongation, it peels the entire stem upwards and after loosening from margin of pileus it drops down on the lower part and forms an "inferior" annulus. When it is not loosened from the gills or margin of pileus until the stem is nearly elongated, it peels off only from the apex of the stem and later from the gills and margin of pileus and forms a "superior" annulus. The latter is much the commonest method, and the layer of tissue which in this case holds on to the gills for a time and conceals them is called the "inner veil." Sometimes this inner veil separates at the stem instead of at the margin of the pileus and so hangs in shreds or in pieces from the margin of the pileus. In fact conditions of weather, etc., may cause all sorts of variations from the above two most common methods. The surface of the stem where the outer layer has been peeled off to form the annulus, usually becomes roughly floccose. Sometimes also the outer rind is split and broken in various ways by drying, as shown in our figures of *A. rubescens;* at other times the stem is glabrous.

Properties. This is usually called the "poisonous genus," as some of the species are sure to cause death. Poisonous species occur also in many other genera, but the poisons are not as deadly. Some Amanitas are known to be edible, as for example, *A. caesarea* and *A. rubescens.* But one who has not a thorough knowledge of most of

the mushrooms, including their microscopic characters, would be unwise to eat any of the species of Amanita, since the poisonous species sometimes approach the edible ones quite closely in general appearance. And to serve them to others under ordinary circumstances is worse than criminal. For further discussion see "Chapter on Mushroom Poisons," and remarks on individual species.

Identification of Amanitas is not always easy. Even those who know all the genera and their characters will proceed cautiously. The stems with their volvas are often deep in the ground and one must get the whole plant if amateurs are to be asked to pass upon them, else they may not take account of this danger-signal—the presence of a volva "death cup". The species with a powdery volva often lose the remnants by the time they are fully expanded, and might be referred to Lepiota by mistake. *When both volva and annulus are present on a plant with white gills or white spores, an Amanita is certain.* Young undeveloped "buttons" are the more dangerous, since they then imitate to an extent the common widely used, edible mushroom *Agaricus campestris* in its button stage. Of course, an experienced mycologist would "feel" the difference when picking it up, but amateurs and those who collect only the "pink gilled" mushroom, may in this way easily make a sad mistake. The prudent collector of mushrooms for the table, no matter where they grow, or how many he has examined, will always look on the under side of the cap for the white gills, and at the bottom of the stem for the remains of the volva.

The SPORES vary from spherical to elliptical. They are rather large, smooth, granular or nucleate, and white, and their size and shape are most important in diagnosing closely related species.

The TASTE of fresh Amanitas varies. The deadly *A. phalloides* has a bitter taste due to its poisonous content. The edible *A. caesarea* is considered in Europe one of the finest flavored mushrooms, and is highly prized. The ODOR is sometimes strong, as in *A. chlorinosma* Pk. In this species it resembles chloride of lime. In many species the odor is not marked, and cannot be used to recognize species.

HABITAT. Amanitas prefer the woods or borders of woods and thickets. Rarely, however, they are found on lawns, or in fields, especially in towns which have groves or whose outlying residences are situated among the original forest trees. Some species prefer conifer forests, others hardwoods, while others are partial to particular soils. *A. spreta*, *A. russuloides* and *A. peckiana* have been found in Michigan only in the sandy regions. *A. phalloides*

prefers the deep moist forest humus. *A. verna* is partial to the edge of groves, although widely found elsewhere. I have occasionally found it growing from the very rotten cavities of stumps or logs. There is no rule which we can be sure that they may not break in their selection of a place to grow.

The genus is with difficulty divided into natural sections. Those mycologists who laid the foundations of classification, like Fries and Quelet, divided the genus by the different ways in which the universal veil forms a volva. Prof. Atkinson has shown that a single species, *A. phalloides,* may act, under different weather and growth conditions, so that some specimens can be placed under one section, other specimens under another section. Monsieur Bondier (Bull. Soc. Myc. France, 18, 1902) has pointed out that although this is true, we can still tell them apart if we take account of the differences in the structure of the universal veil. For example, in the "Phalloides" section the universal veil is membranous and composed of narrow-celled hyphae, and the veil when it does tear in a circumscissle manner, leaves thin shreds on the cap, never in the form of elevated warty-scales; while in the "Muscaria" section the universal veil is composed of large, rounded cells which do not cohere well, and hence the veil breaks in a circumscissle manner, and leaves thick floccose warts on the cap. We will therefore follow the old divisions and group them in sections with reference to the texture and dehiscence of the universal veil. Twenty-two species have been so far found in the State. Since the genus Amanita, by virtue of its species with poisonous properties, is of great interest, and its species need to be known as widely as possible, it has seemed best to include in the following synoptical key all of the species of the northeastern part of the United States that one might be likely to find in Michigan.

Key to the Species

(A) Base of stem, or bulb, provided with a distinct, membranous, loose cup-like sheath, or rarely with a shallow cup.
  (a) Pileus orange-red, yellow or straw-colored.
    (b) Volva entire, large; pileus deep yellow to orange, striate on margin, glabrous. 639. *A. caesarea* Fr.
    (bb) Volva saucer-shaped; pileus straw-yellow, usually with floccose warts, margin even. 649. *A. mappa* Fr. (form B).
  (aa) Pileus white with delicate pinkish or cream-colored appressed, fibrillose scales; inner veil evanescent; volva large; stem faintly rubescent. 645. *A. peckiana* Kauff.
  (aaa) Pileus pure white; bulb rounded below.
    (b) Pileus conical at first; inner veil adhering to gills or edge of pileus. 643. *A. virosa* Fr.
    (bb) Pileus convex to subcampanulate; stem with a well-formed annulus.

(c) Plant rather stout; basidia 4-spored; volva large. 641. *A. verna* Fr.
(cc) Plant slender; basidia 2-spored; otherwise like preceding. 642. *A. bisporigera* Atk.
(aaaa) Pileus brown, umber, gray, drab or shades of these.
(b) Base of stem cylindrical, not bulbous; pileus pale brown to umber. 646. *A. spreta* Pk.
(bb) Base of stem bulbous, bulb rounded.
(c) Pileus viscid, pale smoky olive, umber, or smoky white, often with shreds of veil on top; annulus apical, white. 640. *A. phalloides* Fr.
(cc) Pileus scarcely viscid or dry; stem slender.
(d) Spores elliptical, 11-13 x 7-9 micr.; pileus brown or grayish-brown; disk with white patch-like scales. 648. *A. recutita* Fr.
(dd) Spores globose.
(e) Pileus scarcely viscid, fuscous to pale brown, glabrous; annulus distant, brownish; bulb rather small. 644. *A. porphyria* Fr.
(ee) Pileus with numerous ash-colored appressed scales; ash-colored pulverulence on stem. 647. *A. tomentella* Kromb.
(AA) Base of stem or bulb without a cup-like, free-margined volva.
(a) Pileus orange, yellow or straw colored.
(b) Margin of pileus markedly tubercular-striate, yellowish to straw color; annulus evanescent; volva usually evanescent or a few scales on bulb. 656. *A. russuloides* Pk.
(bb) Margin even or only slightly striate; pileus orange to bright yellow; annulus persistent.
(c) Flesh of stem changing to reddish when bruised or in age. 658. *A. flavorubescens* Atk.
(cc) Flesh not reddish.
(d) Pileus large, more than 7 cm. broad; stem stout, provided with prominent, concentric scales or rings on or above bulb. 650. *A. muscaria* Fr.
(dd) Pileus less than 7 cm. broad.
(e) Bulb with an adherent, inrolled, collar-like ring on its upper margin; spores spherical. 651. *A. frostiana* Pk.
(ee) Bulb and pileus with a few, flocculent masses of the friable, yellow volva; spores oval; common. 659. *A. flavoconia* Atk.
(aa) Pileus not yellow nor yellowish.
(b) Odor strong of chlorine or chloride of lime; stem bulbous-napiform, more or less deeply rooting; plant entirely white and very densely floccose-scaly. 655. *A. chlorinosma* Pk.
(bb) Odor not penetrating like chlorine.
(c) Base of stem more or less deeply rooting below an enlarged or concentrically furrowed bulb.
(d) Pileus white to grayish; plants large and stout, densely floccose scaly. 654. *A. solitaria* Fr. *A. strobiliformis* Fr.
(dd) Pileus or its scales grayish-brown to umber-brown; plants slender, covered with a loose pulverulence; spores 8-12 x 4-6 micr. *A. cinereoconia* Atk.
(cc) Base of stem rounded, or at most short conical below.
(d) Flesh of stem or of whole plant turning to reddish where bruised or in age.
(e) Pileus decorated with yellow powdery masses; flesh changing to red only toward base of stem. 658. *A. flavorubescens* Atk.
(ee) Pileus decorated with grayish or reddish-stained, floccose warts; whole plant becoming reddish, never yellow. 657. *A. rubescens* Fr.

(dd) Flesh not turning red when bruised.
(e) Pileus, etc. white or whitish.
(f) Bulb at base of stem provided with a concentrically grooved close-fitting inrolled sheath; annulus superior. 652. *A. cothurnata* Atk.
(ff) Bulb with remnants of volva variously disposed.
(g) Stem floccose-scaly or torn, below with an ovate bulb, which is concentrically scaly.
(h) Annulus adorned with yellow floccules, ample, distant; stem stuffed by pith, soon hollow; pileus covered with dense, white, floccose patches. 653. *A. chrysoblema* Atk. sp. nov.
(hh) Annulus white, ample, apical; stem solid-stuffed; pileus with angular or pyramidal warts. *A. caudida* Pk.
(gg) Stem slender, glabrous or pulverulent, bulb naked or with remains of friable volva.
(h) Entirely white; pileus 5-10 cm. broad, with angular, erect warts; bulb subglobose, abrupt; annulus persistent. *A. abrupta* Pk.
(hh) Pileus grayish-white or yellow-tinged, 2-5 cm. broad, adorned with flocculent scales; annulus evanescent, slight; edge of gills crenulate-floccose. *A. crenulata* Pk.
(ee) Pileus brown-gray, smoky brown to umber.
(f) Annulus inferior, broadly pendant; pileus rich hair-brown to umber-brown; bulb ring-margined above. *A. velatipes* Atk.
(ff) Annulus superior.
(g) Margin striate; upper margin of bulb with appressed ochreate volva, sometimes with rings above it. *A. pantherina* Fr.
(gg) Margin not striate; pileus with grayish scales.
(h) Volva friable; pileus with mealy scales; gills adnexed by decurrent lines; bulb oval or globose. Spores 8-9 x 5-6 micr. 660. *A. spissa* Fr.
(hh) Volva friable-floccose; gills free; bulb marginate-rounded, concentrically grooved. Spores 11-13 x 6-8 micr. (Boudier). *A. excelsa* Fr.

Section I. Universal veil splitting at apex; volva *persistent* on bulb or base of stem, usually *forming a true cup*, its upper part free from stem or merely collapsing on it, *membranous;* surface of pileus bare (except occasionally in *A. phalloides* and *A. spreta* in which thin membranous shreds or patches remain on pileus).

639. Amanita cæsarea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Vol. II, No. 97.
Bresadola, Fungh, mang. e. vel., Pl. 1.
Atkinson, Mushrooms, Plate 18 and 19, 1900.
Hard, Mushrooms, Fig. 28 and 29, 1908.
Marshall, Mushroom Book, Pl. 4. op. p. 50, 1905.
Peck, N. Y. State Mus. Rep. 48, Pl. 15, 1897.

Not yet reported in Michigan. It is occasionally found farther south. The present known range seems to be as far north as latitude 43°. This would bring it into southern Michigan where no doubt it will yet be found. Its name indicates that it is the emperor of its genus, and its large, showy, orange to red cap and perfect volva fully justify the name. *The pileus is striate and glabrous; gills and stem are yellow.* "The thick volva, before splitting is about the size of a hen's egg and of like shape and color." It is edible, and was served to the Caesars of Rome as a delicacy long ago. It approaches the deadly *A. muscaria* in color, except that the gills of the latter are white. Avoid eating it unless intimately acquainted with both species. It often forms large fairy rings.

640. Amanita phalloides Fr. (Deadly Poisonous)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 3 (as *A. bulbosa,* the green variety).
Bresadola, Fungh. mang. e. vel., Pl. 2, (green variety).
Cooke, Illustrations, Plate 2, (yellow variety).
Ricken, Blätterpilze, Pl. 75, Fig. 2.
Fries, Sverig. ätl. u. gift. Svamp., Pl. 2.
Farlow, Bull. No. 15, U. S. Dept. Agr., Plate XXIII, 1898. (See also Hard, Mushrooms, Fig. 11, p. 21, 1908, for same figure.)
Atkinson, Mushrooms, Plate 14, Fig. 56, 57 (umber to olive variety).
Marshall, Mushroom Book, p. 48, 1905.

PILEUS 5-12 cm. broad, at first ovate or rounded, then subcam-

panulate to expanded, quite *viscid* when moist, *umber-brown* to *smoky olive,* sometimes virgate, often paler or whitish on margin, glabrous or with few remnants of the universal veil in the form of thin shreds or patches, *margin even.* GILLS free or adnexed by a line, medium broad, close, white. STEM 8-20 cm. long, 6-12 mm. thick, cylindrical above bulb, varying stout to slender, *glabrous* to subsquamulose, stuffed by fibrils then hollow, white or tinged by color of pileus. ANNULUS superior, *white,* ample, pendant, membranous. VOLVA mostly buried in the ground, forming a loose or appressed cup, sometimes entire and lobed, often irregularly torn, formed by the *universal veil dehiscent or tearing in shreds at the apex,* not truly circumscissile, *its texture membranous,* not floccose. SPORES spherical-ovate, the ovate-pointed side ending in a rather stout apiculus, 9-12 (with apiculus) to 8-9 micr., granular within, white, smooth. ODOR rather nauseous.

Scattered or gregarious. In conifer or frondose woods, borders of woods, thickets, rarely on lawns, etc. Common throughout the State. July to September (earliest record July 9, latest September 24).

The form with circumscissile universal veil belongs under *A. mappa.* The typical form with dark cap described above is rather common and recognizable by the umber to olive-brown colors or paler shades of these colors, the even margin, the rather ample volva which may be reduced in size by the shreds it sometimes leaves on the cap, by the subglabrous stem and spherical-ovate spores. It is distinguished from *A. mappa,* form (*A*) by the membranous texture of its universal veil which does not split in a truly circumscissile manner, by the more ample volva, and by the shreds which when present on the cap are membranous, not floccose-warty. In this separation, I have followed Boudier, the eminent French mycologist. This is one of our most deadly mushrooms, no antidote having yet been discovered for its poison. The amateur need not attempt to keep *A. phalloides* and *A. mappa,* form (*A*) apart, as they are equally poisonous. The autumnal yellow form is more easily distinguished but is also a deadly species. See Chapter on Poisons. In Europe, the green variety is very common; their yellow variety (*A. bulbosa*) is referred by Ricken to *A. mappa.* We do not seem to have these color forms here.

641. Amanita verna Fr. (Deadly Poisonous)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Plate 3 (bulb imitates that of *A. mappa*).
Gillet, Champignons de France, (as *A. bulbosa* var. *alba*).
Bresadola, Fungh. mang. e. vel., Pl. 4.
Atkinson, Mushrooms, Fig. 59 and 60; also Fig. 55 (as *A. phalloides* var. *alba*), 1900.
Marshall, Mushroom Book, p. 48 (probably *A. verna,* given as *A. phalloides*), 1905.
Murrill, Mycologia, Vol. 5, Pl. 87, Fig. 1. (As *A. phalloides.*)
Hard, Mushrooms, Fig. 16, p. 27, 1908.
Plate CXVI of this Report.

PILEUS 5-12 cm. broad, elongated ovate then *convex* to subcampanulate, finally expanded, *pure white,* viscid when moist, *glabrous,* without patches from the veil, *even* on margin. GILLS free or adnexed by a line, not broad, subventricose, crowded, *white,* edge floccose or pulverulent. STEM pure white, 8-20 cm. long, *rather stout,* 8-15 mm. thick, cylindrical above bulb, or tapering upward, *stuffed,* then somewhat hollow, glabrous or floccose-scaly, bulb oval or orbicular, not as wide as in *A. mappa, sunk in the ground.* ANNULUS ample, superior, pendant, white, membranous, not disappearing normally. VOLVA firm, thick below, thinning out toward lobed margin, derived from the entire universal veil, which dehisces at its apex, membranous, white, forming a genuine cup the ample free margin of which is at first rigid then appressed to stem. SPORES spherical-ovate, the ovate-pointed end terminating in a rather stout apiculus, granular within, white, 9-12 (with apiculus) x 8-9 micr., immature spores smaller. BASIDIA 4-spored. ODOR nauseous or slightly so.

Solitary or scattered gregarious. In conifer, mixed or frondose woods or thickets, rarely on lawns, often in clearings. Very common throughout the State. July-October (latest record October 11.)

This beautiful, pure white, stately and deadly poisonous Amanita is called the "destroying angel." In the egg-stage it is easily confused by the inexperienced with *Agaricus campestris. The hidden volva must be looked for in every white mushroom gathered for the table so as to avoid it. A. verna* has spores like *A. phalloides;* and

spores which are larger and less truly spherical than in *A. mappa.* From the next species it is separated by its four spores to each basidium and by its stouter habit. But to the amateur, *A. verna, A. bisporigera* and *A. virosa* will look alike, and as they are equally poisonous, he need not separate them. They are only kept distinct for scientific reasons. The bulb, as well as the adjustment of the volva on it varies considerably so that unless it can be shown that the microscopic characters differ, the so-called "*alba*" var. of *A. phalloides* and *A. verna* proper are here combined into one. It seems to have no soil preference with us, although Boudier says it is partial to limestone land. I have found it on clay and sandy soil in southern Michigan, and on the rocky foundations of the Lake Superior region. See Chapter on Poisons.

642. Amanita bisporiger Atk. (Deadly Poisonous)

Botanical Gazette, Vol. 41, 1906.

Illustration: Atkinson, Mushrooms, Fig. 61, 1900 (as *A. verna*).

Like *A. verna,* except in its more slender habit, and the *2-spored basidia.* Pileus 4-7 cm. broad. Stem 8-12 cm. long, 5-8 cm. thick above the bulb which varies from 2-4 cm. in thickness. Whole plant is pure white, and only separable from *A. verna* in the field after some experience. I have examined the 2-spored character frequently and it seems to be constant.

Usually solitary. Throughout the State, in hemlock or frondose woods. One specimen was found growing from a rotten hemlock trunk near its base, in the Huron Mountains. July to September. Frequent. Poisonous.

643. Amanita virosa Fr. (Deadly Poisonous)

Hymen. Europ., 1874.

Illustrations: Fries, Sverig. ätlig. u. gift. Svamp., Pl. 84.
Cooke, Ill., Pl. 1.
Gillet, Champignons de France, No. 6.
Atkinson, Mushrooms, Fig. 62, p. 62, 1900.

Like *A. verna,* except that it has a conical pileus when young; the annulus is rarely formed, because the inner veil remains

attached to gills and edge of pileus and becomes torn into parts or shreds; the stem has a tendency to be eccentric, and is usually floccose or squamulose, and the spores are slightly smaller, spherical-ovate, 8-9 (with apiculus) x 7-8 micr., white. It seems to be partial to sandy soil in this State. Ann Arbor, New Richmond. September. Infrequent. Poisonous.

644. Amanita porphyria Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 5.
Plate CXVII of this Report.

PILEUS 3-6 cm. broad, at first campanulate then expanded, *glabrous, pale brown,* disk smoky-brown, moist or subviscid, silky and obscurely virgate when dry, *margin even.* Flesh thin, white. GILLS white, slightly *adnexed,* close, medium in width, subventricose, thin. STEM rather slender, 7-12 cm. long, 4-6 mm. thick, subequal, soft, even, glabrous, stuffed then hollow, whitish to pale brown, *with a small bulb.* ANNULUS superior but distant, thin, membranous, white *becoming brown-tinged, pendant.* VOLVA white, thin, flaccid, membranous, forming a thin cup, imbedded with the bulb in the soil, somewhat evanescent. SPORES spherical, 7-9 micr. diameter, granular within, smooth, white. BASIDIA 4-spored.

In low, swampy ground, among poplars and willows. July. Ann Arbor. Rare.

Distinguished from *A. tomentella,* by its sheathing cup and glabrous pileus. Our plants did not have the purplish tinge reported as frequent in European plants. Gillet gives a good figure. The annulus becomes brownish and is thin and drapes the stem at some distance from the apex. In this and other respects it differs from small forms of *A. phalloides.* This appears to correspond with Ricken's *"forma volvata."* (Blätterpilze, Pl. 75, Fig. 3.)

645. Amanita peckiana Kauff. (Suspected)

Mycologia, Vol. V, p. 67, 1913.

PILEUS 5-9 cm. broad, at first ovate, becoming broadly convex or nearly plane, white, glabrous at first, *then fibrillose or somewhat scurfy with numerous minute pinkish or cream-colored squam-*

ules, not striate, margin at first incurved and bordered by the thickish union of the universal and partial veil, at length crenate-fringed or lacerate-appendiculate. FLESH firm, thickish, white. GILLS free or attached by a line, reaching the stem, moderately broad, much broader in front, subellipsoid, pure white, flocculose on edge, trama divergent. STEM 5-9 cm. long (rarely up to 13 cm., 1-2 cm. thick, stout, tapering slightly upward, stuffed by loose pith, then hollow, white, *at first bulbous,* the bulb covered by a thick, firm, loose VOLVA which is margined with ovate lobes, the flesh often pinkish or salmon-colored, especially toward base. ANNULUS evanescent, but in the young plants the gills are concealed by the very thin inner veil. SPORES elongate-oblong or subcylindrical, obtuse, 13-16 x 5-7 micr., sometimes slightly narrower toward one end, white in mass. BASIDIA 46-50 x 9 micr., elongate-clavate, 4-spored. STERILE CELLS on edge of gills, inflated, pyriform, variable in size. ODOR none or very slightly of radish.

Gregarious. On sandy ground under white pine in open groves. New Richmond. September. Infrequent.

Known by the fringed margin of the pileus, the large, two-layered volva, the thin, evanescent inner veil, the peculiar delicate innate, fibrillose scales on the cap and stem and the large subcylindric spores. The volva is entirely immersed in the sand; it splits usually at the top of the young cap into ovate lobes and at length seems spuriously two-layered below by the separation of a thick layer of the bulb so that finally the stem is removable and appears subcylindrical at base. Rarely the volva breaks so as to leave a large thick piece on top of the cap as in *A. coccola* Scop. In some respects it approaches *A. spreta* Pk., but differs distinctly in color and spores. Sometimes the surface of the cap is beautifully dotted by the pale salmon-colored, delicate scales. The volva may reach a large size, 4 to 5 cm. high and 3 to 4 cm. across. The inner veil is very thin and often remains adnate to the stem at first, and appears to be absent; in the mature plant it is rarely to be made out. This species is close to if not identical with *A. coccola* Scop. (sense of Boudier, Soc. Myc. d. France, Bull. 18, p. 253 and Pl. 13). The shape and size of the spores are figured and described like those of our species. The margin of the pileus, however, is said to be always striate, Saccardo says "sulcate." On the other hand, the inner veil of *A. coccola* is said to be very thin and evanescent, and the figures, showing the volva, are very suggestive of our plant. Furthermore, Ricken (Blätterpilze, under *A. ovoidea*) quotes Quelet as authority for the statement that the flesh of *A.*

coccola assumes a reddish hue. Some consider the latter species a form of *A. ovoidea* Fr. to which our plant cannot be referred, but to which it may be related.

646. Amanita spreta Pk. (Deadly Poisonous)

N. Y. State Mus., Rep. 32, 1879.

Illustrations: Atkinson, Mushrooms, Fig. 71, p. 69, 1900.
Plate CXVIII of this Report.

PILEUS 7-12 cm. broad, ovate at first, then broadly convex-expanded, *pale brown to umber-colored,* often unicolorous, *glabrous* or with a few large patches of the white universal veil, slightly viscid, *margin even* or obscurely striatulate. FLESH white, soft, thick, abruptly thin at margin. GILLS crowded, *reaching the stem* and adnexed by a decurrent line, rather broad, narrowed behind, subventricose, pure white, edge fimbriate-serrulate, its trama with diverging hyphae. STEM 10-15 cm. long, *stout,* 10-20 mm. thick, equal or tapering slightly upward, stuffed then hollow, striate and mealy above the annulus, subglabrous or subfibrillose below, *whitish, not bulbous,* inserted at base into the *rather large, thickish, persistent, membranous, sheathing, white* VOLVA. ANNULUS white above, tinged umber beneath, thin, membranous, superior. SPORES elliptical, 11-12 x 6-7 micr., *nucleate* at maturity, smooth, white. No cystidia. Basidia 4-spored.

Solitary or gregarious. On *sandy soil,* in the pine plains of western Michigan now covered with scrub-oak, etc., where it is frequent. September. New Richmond, along the Kalamazoo River.

Known by the sheathing volva and the bulbless stem, which are both deeply immersed in the sandy soil and imitate *Amanitopsis vaginata* in this respect. The color of the pileus is uniformly darker than it is given by Peck. It prefers sandy soil. Its stout habit and its spores, as well as the base of the stem, are strikingly different from *A. porphyria. A. cinerea* Bres. of Europe also lacks the bulb but is a much smaller plant.

Section II. Universal veil splitting in a circular line between bulb and pileus (*circumscissile*), the upper half adhering *on the pileus* in the form of *floccose scales, warts or pyramids,* the lower half adhering to the bulb or the base of the stem and forming abrupt inrolled sheaths, or several imperfect rings. The universal veil is composed of globose, inflated cells, at least in the upper part.

**Annulus median or inferior.*

647. Amanita tomentella Kromb. (Suspected)

Naturgetreue Abbildungen, 1831.

Illustrations: Krombholtz, ibid.
Ricken, Blätterpilze, Pl. 76, Fig. 1. (As *A. porphyria.*)

PILEUS 4-9 cm. broad, convex then expanded, umber-brown or paler, with a tinge of violaceous (ecru-drab, Ridg.), almost dry, *radiately-silky,* shining, covered by numerous, delicate, pulverulent-floccose, appressed, ash-colored scales, *margin even* and decurved. FLESH white or tinged ashy under the separable pellicle. GILLS white, rather narrow, of equal width, close, free or decurrent by a line, *edge minutely fimbriate and sometimes ashy-tinged.* STEM 7-9 cm. long, tapering upward from the thick, ovoid bulb, stuffed then hollow, often *with an ashy pulverulence both above and below the distant annulus,* innately scaly below, whitish. VOLVA thick, circumscissile, covered with tomentose pulverulence, its margin thick, short and somewhat angled. ANNULUS median, usually ample, membranous, thin, persistent, ashy-colored on under side, somewhat striate above. SPORES *spherical,* 8-9.5 micr. in diam., smooth, white with minute apiculus.

(Dried: Cap shining, chestnut, scales paler; gills pale alutaceous.)

Solitary. In conifer and mixed woods of northern Michigan. Isle Royale, Houghton, Munising. August-October. Infrequent.

I have restored Krombholtz's name in order properly to limit our plant. According to Boudier *A. recutita* has oval spores, 11-12 x 7-9 micr. in size. Except for this discrepancy, this form would be referred to that species. It differs from *A. porphyria* in belonging to this section, by reason of its circumscissile universal veil and the floccose structure of the scales on the cap, which are numerous; the spores, however, are the same. No doubt our plant is one of three different species, which are closely related. It is easily known

by the ashy-colored pulverulence on cap and stem, and the median, pendant annulus. The main color of the pileus varies from umber-brown to drab, with an obscure tinge of lilac or purplish. It is an autumnal Amanita of the conifer forests.

648. Amanita recutita Fr. var. (Suspected)

Epicrisis, 1836-38.

Illustration: Michael, Führer f. Pilzfreunde, Vol. 3, No. 124.

PILEUS 5-8 cm. broad, convex-plane, dry, grayish, *brown on disk,* disk dotted with patch-like whitish scales, striate on margin. FLESH rather thin, white. GILLS free but with decurrent line, *rather narrow*, close, white or whitish, trama divergent. STEM 8-9 cm. long, *slender,* 7-10 mm. thick, *silky,* white, equal above the small rounded bulb. ANNULUS membranous, thin, subpersistent, distant ,narrow, whitish. VOLVA sheathing but short, truncate, thickish, extending above bulb, whitish. SPORES broadly elliptical, oval to subpyriform, 11-13 x 7-9 micr., variable in shape, smooth, white. BASIDIA 40-45 x 10 micr., attenuated downward, 4-spored. ODOR none.

On sandy soil, coniferous region, under thickets. New Richmond. September. Rare.

This species is distinct from *A. porphyria* and *A. tomentella,* which it imitates in size and coloring, and by its large spores. It differs also from *A. porphyria* in the mode of breaking of the universal veil, the greater part of which remains at the base of the stem in the form of a thimble. The spores agree with the species as known to Boudier. (Soc. Myc. d. France, Bull. 18, p. 259.) The striations of our plants extend halfway to the center of the cap and this seems to be an aberrant feature, although the descriptions by European authors are not very full.

**Annulus superior.*

649. Amanita mappa Fr. (Deadly Poisonous)

Hymen. Europ., 1874.

Illustrations: Cooke, Ill., Pl. 4 (shape, etc., but not with the colors of the American plant).
Bresadola, Fungh. mang. e. vel., Pl. 5.
Rolland, Bull. de la soc. Myc. de France, Pl. IV, Fig. 1.
Ricken, Blätterpilze, Pl. 77, Fig. 2.
Atkinson, Mushrooms, Fig. 58, p. 58 (as *A. phalloides*), 1900.
Hard, Mushrooms, Fig. 24, p. 35, 1908.

PILEUS 4-8 cm. broad, convex then expanded, usually very regular, *margin even.* FLESH white, not very thick. GILLS *free* or adnexed by a line, close, medium broad, *white.* STEM subcylindrical above the *very broad, abrupt, subdepressed bulb,* stuffed then hollow.

There are two forms with us: (A) PILEUS *smoky-umber varying to dark olive,* sometimes almost white, often paler in color or umber color only present on disk, the rest being whitish covered with floccose soft scales, the upper part of the universal veil. STEM with a very abrupt, depressed, margined bulb above the edge of which the margin of the circumscissile volva may project slightly, bulb rounded below, surface of stem glabrous or nearly so, white or tinged smoky brown. SPORES globular, 8-9 micr., apiculate. ANNULUS superior, white, membranous. VOLVA evanescent on bulb, but remaining on cap. This form is usually confused with *A. phalloides.*

(B) PILEUS *yellowish-white to straw-color,* rarely approaching sulphur-yellow, covered with more or less persistent, *floccose,* sordid-white or pale brownish scales. GILLS with edge floccose-crenulate, due to globose-pyriform sterile cells, its trama with divergent hyphae. STEM with *depressed saucer-shaped* wide bulb, up to 3 cm. diameter, cylindrical above, 10-15 mm. thick, pallid, or tinged very slightly with drab, almost glabrous, 6-9 cm. long. ANNULUS superior, *straw-colored* as a rule, membranous, rather ample. VOLVA appressed on the bulb, its short, thick, cup-margin free from stem and leaving a space between it and the stem, rarely obtusely short-lobed. SPORES *perfectly globular,* with an abrupt apiculus, 7-9 micr. diameter, or smaller when immature, granular within, white.

Form (B) is autumnal, rarely appearing before September, when it is common throughout the State. September to November (earliest record August 25th, latest November 2). It seems to prefer sandy soil, but also occurs in sandy-clay soil. Boudier says it seems to be lacking in clay soil in France; he also gives spores slightly larger. Found in white pine or hemlock forests, as well as in oak, maple, etc. Both forms have a circumscissile volva, the upper part of which is floccose in structure, the lower membranous. It is therefore intermediate between the first and second sections. The European form is said to have a nauseous odor. It is *poisonous* like *A. phalloides.* The spores of the yellow form are entirely spherical and the apiculus is abrupt and very slender and short; in this it differs from *A. phalloides,* which has spores with the spherical shape but on the side of the apiculus becomes somewhat ovate-pointed, the point ending in a rather stout apiculus; this diameter is therefore a few microns longer, sometimes 10-12 micr. long to 9 broad.

650. **Amanita muscaria** Fr. (Deadly Poisonous)

Syst. Myc., 1821.

Illustrations: Gibson, Our Edible Toadstools and Mushrooms, Pl. IV (colored), 1895.
Farlow, Bull. No. 16, U. S. Dept. Agr., Pl. 22, copied by Hard, Mushrooms, Fig. 13, 1908.
Atkinson, Mushrooms, Frontispiece (colored), also Pl. 12-13, Figs. 52, 53 and 54, 1900.
Marshall, Mushroom Book, Pl. III (colored), 1905.
Murrill, Mycologia, Vol. 5, Pl. 85 and Pl. 87, Fig. 3.
McIlvaine, Amer. Mushrooms, Pl. IX, 1900.

PILEUS 8-20 cm. broad, at first ovate or hemispherical, then broadly convex to plane, viscid when young and moist, *yellow,* sometimes orange or orange-red, rarely whitish, *covered with numerous, whitish or pale yellowish warts,* margin at maturity *slightly striate.* FLESH white, or yellowish under the separable pellicle. GILLS reaching the stem, but free or decurrent by a line, crowded, broadest toward front, *white.* STEM 10-20 cm. high, equal or tapering upward, loosely stuffed then hollow, ovate-bulbous below, *white* or tinged yellow, with a white annulus above, the lower half floccose-scaly or somewhat lacerate, and near the bulb *provided with prominent concentric scales or rings,* which are the remains of the broken

veil. ANNULUS large, thick, superior, white. VOLVA is much torn and surrounds the bulb and the stem just above the bulb in the form of scales or rings. SPORES broadly oval, 9-10.5 x 6-7.5 micr., smooth, usually with a large oil-globule nearly filling the spore, obliquely apiculate, white. ODOR and TASTE usually insipid in the fresh condition of the mushroom; its poison when extracted is, however, extremely bitter.

(Dried: More or less ochraceous to alutaceous throughout, the scales on pileus always paler.)

Gregarious or closely massed, often in large fairy rings. In thickets of poplar, wood-lots of oak and maple, forests of pine or hemlock, cemeteries, roadsides, etc., widely distributed *throughout the State.* Sometimes on poor, gravely soil, sometimes in swampy poplar woods, usually on denuded or pastured ground if found under conifers. July-October. Frequent.

One of the most showy and attractive mushrooms of the State. Known by its size, its yellow caps ornamented with whitish patches, its white gills and scaly bulb. *A. frostiana* and *A. flavoconia* have similar colors, but are much smaller. In Europe, the colors are bright scarlet and very striking. With us this form does not occur. Our species is really a color-variety of the European plant, much like that which European mycologists name var. *formoso,* except that our plant has white scales on its pileus. *A. flavorubescens* has soft yellow scales but is otherwise much different from var. *formosa* as described, with which it must not be confused. I have no record of the European var. *formosa,* and am not sure that it exists in this country. The color of *A. muscaria* varies somewhat, and in deep shaded places may be white; this is var. *alba.* The stately var. *regalis* with a pale liver colored cap has not been found in the State, although I have seen it in Sweden; it is very large. In wet situations the veil may split as in the preceding section and leave the cap bare; this is var. *puellaris* and is usually smaller.

The deadly *A. muscaria has few uses.* Its poison may yet be found to be of medicinal value, and the early settlers used an infusion of it to make "fly paper," which was an effective remedy for the troublesome house-fly—sometimes, but which caused disaster if small children partook of it. It is a delightful object for the artistic eye of the nature lover but in all other respects a menace.

651. Amanita frostiana Pk. (Not Poisonous)

N. Y. State Mus. Rep. 33, 1880.

Illustration: Atkinson, Mushrooms, Frontispiece, Fig. 2 (colored), 1900.

PILEUS 3-6 cm. broad, convex or expanded, bright orange or yellow, only slightly viscid, decorated with yellowish scales or warty patches, which are sometimes lacking, striate on margin. GILLS free, white or slightly tinged with yellow, close, broadest toward front. STEM 5-8 cm. long, 4-5 mm. thick, white or yellowish, *stuffed,* bearing a slight, sometimes evanescent annulus, *with a distinct bulb which is margined above with a collar-like ring.* ANNULUS superior, thin, fragile. VOLVA floccose-membranous, adhering on bulb in concentric scales or prominent rings as in *A. muscaria,* but less marked. SPORES globose, 7.5-10 micr., smooth, white, granular within.

Solitary or few. On very rotten hemlock logs and debris, in hemlock and mixed woods of the northern part of the State. Huron Mountains, Marquette. August-September. Infrequent.

This species is doubtless most often confused with *A. flavoconia* which is sometimes of similar size but has a universal veil composed of a powdery yellow substance, and whose bulb has therefore a different appearance. *A. frostiana* appears more like a small form of *A. muscaria* and prefers shady conifer woods, while *A. flavoconia* is more common in the southern part of the State in frondose woods, even in the open. McIlvaine says it becomes reddish-orange to scarlet farther south and imitates *A. caesarea* in color; but no confusion should be possible between the two since they have different volvas. *A. frostiana* has globose spores; *A. muscaria* has oval spores; besides the spores, the size seems the only important difference. Ford and Sherrick found it contained no deadly poison.

652. Amanita cothurnata Atk. (Suspected)

Studies of Amer. Fungi, Mushrooms, etc., 1900.

Illustrations, Ibid, Figs. 68, 69, 70, pp. 67-68.
Hard, Mushrooms, Fig. 26, p. 37.
Pl. CXIX of this Report.

PILEUS 3-8 cm. broad, at first globose to hemispherical, then

convex-expanded, viscid, especially when moist, *white,* sometimes slightly tinged on centre with yellow or tawny-olive, *covered with numerous, white floccose scales,* margin finely striate when mature. GILLS free, remote, rounded behind, crowded, white, broader in front, edge floccose. STEM 6-12 cm., cylindrical, even, white, *hollow,* minutely floccose-scaly, with a large oval bulb below. ANNULUS superior, white, rather persistent. VOLVA forming a close-fitting covering for bulb and ending above the bulb by a circular roll which is often abrupt. SPORES globose, 8-9 micr., smooth, white, almost filled by a large oil globule.

Gregarious. In oak and maple woods. Ann Arbor, Detroit. July-August. Infrequent.

Have seen only the pure white form in Michigan. This species approaches *A. pantherina,* common in Europe. The latter has a brown to fawn-colored pileus which is long-striate and has whitish warts; its annulus is median, and there are usually several oblique rings of the volva a little above the bulb. Murrill's figure in Mycologia, Vol. 5, Pl. 87, is not of a typical plant. *A. cothurnata* has the bulb abruptly terminated by a close-fitting roll; its cap may have a slight tinge of umber or yellow on the disk. Quelet and Battaile give the spores of *A. pantherina* as oval-elongate, 10-12 micr. long; Karsten and Smith give them 8-9 x 4-5 micr.

653. **Amanita chrysoblema** Atk. sp. nov. (Probably Deadly Poisonous)

Illustration: Plate CXX of this Report.

PILEUS 8-10 cm. broad, convex-expanded, *pure white,* densely covered with white floccose patches or scales, *viscid,* margin finely striate. GILLS free, somewhat remote, *narrow,* close, *white,* plane, heterophyllous. STEM stout, 10-14 cm. long, 1 cm. thick above, *tapering from the clavate-bulbous base,* 2 cm. thick, stuffed by a pith then hollow, very torn-scaly below annulus, floccose above, white, bulb and lower part of stem somewhat adorned by narrow thick rings, the remains of the volva. ANNULUS superior, rather ample, thin, pendant, somewhat distant, *white except a sprinkling of yellow floccules on upper side.* VOLVA floccose, rather fragile, white, in broken rings on bulb and lower stem. SPORES broadly-elliptical, 9-10 x 6-7 micr., smooth, white, granular within.

Solitary. On the ground, in the edge of a sphagnum swamp. September-October. Ann Arbor. Rare.

Differs from *A. cothurnata* in its bulb and annulus characters, and in its elliptical spores. The scales of the stem are due to its torn surface and point upward. The floccose structure of the universal veil and its manner of breaking separates it from *A. verna, A. phalloides* and *A. virosa.* The yellow floccules on the annulus are a character peculiar to this species. *A. crenulata* differs from *A. chrysoblema* in its very evanescent volva, in its gills which reach the stem and have a strongly floccose edge, the floccules of which are sometimes yellow, and in its nucleate spores.

654. Amanita solitaria Fr. (Edible, but use caution)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Pl. 21 and 22, 1900.
Gillet, Champignons de France, No. 16 (as *A. pellita*), No. 8 (as *A. echinocephala*).
Cooke, Ill., Pl. 939.
Var. (A) (*A. strobiliformis*)?

PILEUS 10-15 cm. broad, globose-hemispherical at first, finally expanded-plane, *at an early stage covered by large, firmly adhering, pyramidal warts,* when expanded dotted with floccose, rather soft, brownish warts, not striate, whitish. FLESH white. GILLS free or almost so, crowded, narrow, white or tinged cream-color, *edge entire.* STEM 10-15 cm. or more in length, solid, *rooting napiform-bulbous at first,* then elongated and 1-2 cm. thick, the thick bulb at the first concentrically corrugated by thick, pointed warts, when full grown oval ending below in a large, tapering "root" which penetrates the soil deeply, the bulb then covered with smaller, scattered warts, becoming almost glabrous upward to the ring, whitish. ANNULUS pendant, apical, white then dingy yellowish and disappearing. SPORES variable in shape, 9-12 x 6-7.5 micr., elliptical, smooth, white. ODOR none at any stage.

Solitary on the ground in low woods of maple, oak, etc. Ann Arbor. August. Infrequent.

The spore-measurements agree with the spore-measurements by Bresadola, but not at all with his figure (Fungh. Mang. et. vel., Pl. 8), which shows the surface of the stem torn-scaly like the surface of an open pine cone. It is more like the forms photographed by Atkinson (Mushrooms, Pl. 21, 1900), except for the more napiform bulb and larger spores. Authors disagree widely

as to the characters of *A. solitaria* and *A. strobiliformis.* Boudier (Soc. Myc. de France, Bull. 18, 1902) differentiates *A. solitaria* by its larger spores, 13-15 x 8-10 micr., by its floccose, thinner warts, by the thin, fragile and the cream-colored annulus; and his *A. strobiliformis* has spores 10-13 x 6-8 micr., a turbinate, napiform bulb, and grayish cap covered with very large, thick, adnate angular scales. Ricken (Blätterpilze) reverses the spore size and also considers them smaller: 9-10 x 5-6 micr. for *A. solitaria;* 12-14 x 8-9 for *A. strobiliformis;* at the same time his other characters agree pretty well with those of Boudier's description of the two species. Both Bresadola and Atkinson consider the two species identical under *A. solitaria*, assuming that great variations occur in the nature of the scales on the cap and stem, and in the shape of bulb and stem. That weather conditions cause great variation in these plants, whether a single or composite species, is quite certain. But with such data as those given above, as to size of spores, it becomes necessary to explain by further studies the discrepancies reported by these eminent mycologists.

All European mycologists agree in omitting any mention of an odor of chloride of lime. Hard and McIlvaine report both *A. solitaria* and *A. strobiliformis* with such an odor. I infer from this that American plants which have often been referred here, belong to *A. chlorinosma* Pk. or one of its varieties.

655. Amanita chlorinosma Pk. (Edible, but use caution)

Torr. Bot. Club. Bull., Vol. 6, 1878.
Bot. Gazette, Vol. IV, 1879.

Illustration: Hard, Mushrooms, Pl. 3, Fig. 22, 1908. (As *A. strobiliformis.*)

PILEUS 8-15 cm. or more broad, subglobose at first then convex to expanded, *white* or tinged dingy cream-color, surface with a very variable covering of *dense white floccose scales* or *warts,* sometimes mealy-floccose, sometimes as rounded masses, sometimes pyramidal pointed warts, *always floccose in structure,* except in age they may become hard and adherent, sometimes few and large then again smaller and numerous, margin appendiculate with shreds of veil. FLESH thick, compact, pure white, thinner on margin. GILLS free or adnexed by a point, relatively narrow, subventricose, broader in front, white tinged cream-color, *edge minutely*

flocculose. STEM 6-15 cm. long, rooting, root up to 10 cm. long, ventricose varying to napiform and then very thick, up to 3 cm. at bulb, equal upwards, firm and hard, solid below; spongy-stuffed within the hard outer rind, sometimes becoming cavernous, *floccose-torn* from bulb to annulus, often concentrically floccose near bulb, white. ANNULUS fragile, lacerated, sometimes remaining as a ring with margin quite torn, sometimes adhering to gills or margin of pileus. VOLVA densely floccose, white, mostly left on pileus, sometimes attached to bulb or stem as floccose, irregular concentric, soft scales. SPORES *not large,* 8-12 x 5-7 micr., varying in both dimensions. Young immature spores are spherical then ovate, *elliptical at maturity,* granular within. ODOR *strong of chlorine or chloride of lime, disagreeable.*

(Dried: Dingy-white.)

Solitary or gregarious. In woods on the ground, often on hard, gravelly soil. Lansing, Detroit. Infrequent.

The original description, copied by McIlvaine, was made by Peck from a single specimen. Austin the finder, also published a description at the same time. Since the plant is very variable, in the manner so fully described for *A. solitaria* by Atkinson in his mushroom book, the original description must naturally have many short-comings. Hence I will assume, until we have further data, that all our plants with the strong chlorine odor belong under this species.

Like *A. solitaria, A. chlorinosma* is a large and striking species, usually pure white, becoming dingy cream color; the surface of the whole plant is sometimes thick with a mass of cottony scales. The spores have been found variable and add to the confusion of species. Under the microscope the young and matured spores are shown detached. The young spores naturally measure much less than the mature spores. *A. radicata* Pk. (Bull. Torr. Bot. Club, Vol. 27, p. 609) is described as having large and firm scales; the odor, the spores and the rooting stem are the same as in *A. chlorinosma.* It seems to bear the same relation to *A. chlorinosma* as *A. strobiliformis* bears to *A. solitaria.*

656. Amanita russuloides Pk. (Suspected)

N. Y. State Mus. Rep. 25, 1873.

PILEUS 5-12 cm. or more broad, ovate at first, then convex-expanded, *pale yellow or straw-color,* paler on margin, surface viscid,

covered with whitish, floccose warts which are often lacking entirely or in part, *margin* markedly *tuberculate-striate, striae* 1 to 3 cm. long. GILLS *white,* free or at first reaching the stem, crowded, rather narrow, broadest in front and tapering to stem. STEM 8-15 cm. long, *tapering upward* from bulb, varying in thickness 5-10 mm. at apex to 8-20 mm. above bulb, bulb 1.5 to 2.5 cm. thick, stuffed by webby pith then hollow or cavernous, *white,* glabrous or fibrillose-floccose, the cortex sometimes squarrose-torn. ANNULUS superior, thin, *mostly evanescent,* sometimes loosened and near the bulb, edge sometimes floccose. VOLVA circumscissile, *thin,* fragile, *often disappearing* or forming at first a few subconcentric delicate rings on bulb. SPORES 9-10 x 5-6 micr., elliptical, *nucleate* when mature, smooth, white, apiculate.

Gregarious, rarely subcaespitose, often in large circular patches. *On the sand plains* along the Kalamazoo River, originally white pine forest, now scrub oak, etc. New Richmond. Abundant locally. September.

Known by its peculiar long tuberculate-striae on the margin of the pileus and its thin evanescent volva. The annulus separates and breaks early, and often clings to the apex of the bulb, simulating the species with close-fitting inrolled volva. It was found in great abundance all over the oak-barrens about New Richmond during September, 1910, and is partial to sandy soil which clings to its caps.

This species cannot be *A. junquillea* Quel., as some authors intimate. The spores are larger, the colors paler and the long striations are markedly tuberculate.

Section III. Universal veil *friable* and pulverulent-floccose, circumscissile, *fugacious.* Pileus with soft floccose masses or warts, rarely bare. Bulb of stem bare or with flocculent masses which soon vanish.

657. Amanita rubescens Fr. (Edible, but use caution)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. ätlig. u. gift. Svamp., Pl. 74.
Cooke, Ill., Plate 1163.
Bresadola, Fungh. mang. e vel., Pl. 9.
Gillet, Champignons de France, No. 16.
Patouillard, Tab. Analyt., No. 303.

Ricken, Blätterpilze, Pl. 80, Fig. 1.
Atkinson, Mushrooms, Plates 19, 20, and Fig. 73, 1900.
Hard, Mushrooms, Fig. 27, 1908.
Plate CXXI of this Report.

PILEUS 5-12 cm. broad, oval at first, then broadly convex or campanulate, sometimes expanded, *obtuse,* subviscid when moist, *pale brownish-buff to sordid reddish-brown,* covered with floccose masses or soft warts which are whitish, grayish or reddish-stained, margin even or obscurely striatulate. FLESH soft, thin, whitish, *becoming reddish-stained* when bruised or in age. GILLS narrowed toward stem and free, moderately broad in front, close, *white or whitish,* edge pulverulent under lens. STEM 10-20 cm. long, 8-15 mm. thick, subcylindrical above, clavate-bulbous to rounded-bulbous below, *stuffed,* subglabrous, even or the apex slightly striate and mealy, pink-tinged within and without, dull red where bruised. ANNULUS *broad,* superior, membranous, fragile, often striate on the upper side. VOLVA mostly lacking, *evanescent,* grayish. SPORES elliptical, 7-9 x 6 micr., when mature (immature plants shedding smaller spores), smooth, white.

Solitary or scattered. In oak and maple woods of southern Michigan, mixed woods of conifer regions; it seems to prefer clay soil. Especially common in open or pastured woods. Throughout the State. July to September, far more common in July. Edible.

The color is quite variable, soon tinged with the reddish stains which separate this species from all others except *A. flavorubescens.* When fresh the flesh turns red rapidly where bruised. The stem has a rather hard cortex in dry weather which cracks across and peels in part. Sometimes there are minute, reddish or tawny scales on the stem. The spores are 1 to 2 micr. shorter than in the European plant as shown in specimens I have from Sweden, and by the measurements given by Boudier. Cooke in the Illustrations refers to shorter spores, so that they were probably immature. It is easy to find expanded specimens whose spores are not fully developed. The annulus is usually large and pendant. It is edible, but one must be extremely careful.

658. Amanita flavorubescens Atk. (Suspected)

Jour. of Mycology, Vol. 8, 1902.

Illustrations: Murrill, Mycologia, Vol. 5, Pl. 87, Figs. 4 and 7.
Plate CXXII of this Report.

PILEUS 10 cm. broad, convex to expanded, *covered with floccose or powdery chrome-yellow patches or masses,* which are easily rubbed off, beneath which the surface is lemon-yellow to brownish on disk, margin even or faintly striatulate. FLESH thin, *yellowish.* GILLS *white,* long-elliptical, rather narrow, free or adnexed by a line, close. STEM 8-13 cm. long, 6-12 mm. thick, white, covered above with fine floccose yellow scales, below with reddish scales, its base ending in an oval bulb, stuffed then hollow; its flesh turning slowly reddish when bruised. ANNULUS superior, distant, thin, membranous, fragile, yellow below, white above. VOLVA yellow, powdery, evanescent. SPORES oboval, 8-10 x 6-8 micr., smooth, granular within; basidia 4-spored.

Solitary or gregarious. In frondose woods mixed with Larix. Ann Arbor. Rare. July.

The bright yellow volva, annulus and margin of pileus, and the reddening of the flesh of the stem are its chief distinguishing characters. The pileus may be entirely yellow at first, becoming reddish or sordid brown in age.

659. Amanita flavoconia Atk. (Probably Poisonous)

Jour. of Mycology, Vol. 8, 1902.

Illustrations: Hard, Mushrooms, Fig. 15 (as *A. frostiana*).
Plate CXXIII of this Report.

PILEUS 3-8 cm. broad, convex then expanded, obtuse, viscid, chrome yellow to orange yellow, *covered with numerous, yellow, flocculent masses of the universal veil,* which are easily rubbed off, sometimes bare, margin even. FLESH thin, white. GILLS free, close, medium broad to narrow, *white,* edge minutely fimbriate, trama with divergent hyphae. STEM 6-10 cm. long, 5-10 mm. thick, stuffed then hollow, straight or flexuous, subequal, covered with flocculent scales which are sometimes tinged sulphur-yellow, yellow-pulverulent above annulus, bulbous. ANNULUS superior, membranous, sulphur-yellow to chrome-yellow. VOLVA evanescent,

yellow-pulverulent at first adhering to bulb as small, chrome-yellow, pulverulent masses. SPORES oval, 6-9 x 4-5 micr., white, smooth.

Solitary or scattered. In low, conifer or frondose woods, among decayed debris, on mosses, etc. Throughout the State: Ann Arbor, Detroit, Palmyra, New Richmond, Bay View, Munising, Marquette, Houghton. July-September. Common.

In the even margin of the pileus and the powdery volva it differs from *A. frostiana* which it resembles most, and from small forms of *A. muscaria*. It is about the same size as *A. frostiana,* sometimes larger, and is often erroneously referred to it. With us, *A. frostiana* occurs only in the conifer regions of the State. *A. flavoconia* occurs annually on a bed of *Polytrichum commune* bordering a small lake north of Ann Arbor. It is our commonest, small yellow Amanita and like *A. muscaria,* is widely distributed. The bulb does not become reddish when bruised as in *A. flavorubescens.*

660. Amanita spissa Fr. (Deadly Poisonous)

Epicrisis, 2836-38.

Illustrations: Cooke, Ill., Pl. 69.
Gillet, Champignons de France, No. 3 (as *A. ampla*) and No. 19.
Bresadola, Fungh. mang. e. vel., Pl. 7.
Ricken, Blätterpilze, Pl. 80, Fig. 2.
Plate CXXIV of this Report.

PILEUS 6-10 cm. broad, convex then campanulate-expanded, obtuse, subviscid when moist, shining when dry, *gray with brown or sooty-brown disk,* covered by small, angular, *floccose or pulverulent,* soft grayish scales or warts, glabrescent, margin *not striate.* FLESH rather thin, white. GILLS free but reaching the stem and decurrent by a line, medium broad, crowded, *shining white,* obscurely flocculose on edge. STEM 8-12 cm. long, 1 cm. or more thick, stuffed by a pith, firm, tapering upward, white or grayish, pruinose above, the ring, the clavate or globose bulb, and sometimes the stem above the bulb, covered at first by loose, gray floccose masses. ANNULUS membranous, apical, pendant, entire, white or tinged gray below. VOLVA pulverulent, floccose, evanescent, gray. SPORES broadly elliptical, obtuse, 7-9 x 6 micr., smooth, white. STERILE CELLS on edge of gills inflated-pyriform or globose on a slender stalk. ODOR mild.

Gregarious or scattered. On the ground in frondose woods of oak, maple, etc. Ann Arbor. July. Infrequent.

This species has usually been considered of doubtful occurrence in this country. It has been one of the last of the Amanitas mentioned in this report that I have collected. It is certainly distinct and usually agrees thoroughly with the descriptions, but seems to be rare. Its gray to smoky-brown cap, the pulverulent-floccose, friable, gray universal veil, the non-striate pileus and spores characterize it well. Only the little gray masses on the lower part of the stem and on the surface of the cap, indicate the presence of an outer veil. The annulus is distinct, far up on the stem and sometimes with gray particles on the lower side. After rains there may be no remnants of the veil either on the cap or stem.

Amanitopsis Roze

(From the Greek, *opsis,* appearance of, and *Amanita.*)

White-spored. Stem inserted at base into a volva formed as in Amanita; *partial veil and annulus are lacking;* otherwise like Amanita.

Soft, fleshy, terrestrial, long or slender-stemmed, non-caespitose mushrooms, growing mostly in forest humus, rarely in fields or lawns.

The characters, except the absence of an annulus, imitate so closely the species of Amanita, that the reader is referred to the discussion of that genus. None are definitely known to be poisonous, but the ease with which they can be confused with Amanitas should make everybody extremely cautious. The poisonous *Amanita spreta* Pk. imitates some of the species of Amanitopsis closely, because of its thin, close-appressed annulus. Other Amanitas sometimes lose their annulus, and might be taken for Amanitopsis. Only three species have been collected in the State; about twelve species have been reported from the United States. The following species, not yet found, but included in the key, may be looked for: *A. albocreata* Atk. (this is considered the same as the one described by Peck in the 33d N. Y. State Rep. under *A. nivalis*); *A. farinosa* (Schw.) Atk. which has, however, a somewhat southern and eastern distribution and is one of the smallest Amanitopses; *A. adnata* (Smith) Sacc. reported from the Chicago region, departs from the demands of the genus in having adnate gills. *A. pusilla* Pk. is another small species, its pileus hardly 3 cm. broad. *A. par-*

civolvata Pk. has a brilliant orange pileus shading to whitish on the margin; it has been found from New Jersey to North Carolina. (See colored plate, Marshall, Mushroom Book, Frontispiece, 1905.)

Key to the Species

(A) Volva membranous, cup-shaped or sheathing the base of the stem.
(a) Pileus small, 2-3 cm. broad, pale brown; stem bulbous, slender; spores elliptical, 5-6 x 4 micr. *A. pusilla* Pk.
(aa) Pileus larger; spores 8 micr. or more in the longest diameter.
(b) Gills adnate; pileus even on the margin, yellowish-buff; volva close-fitting, white. *A. adnata* Smith.
(bb) Gills free; pileus more or less striate on margin.
(c) Pileus hairy-squammulose; volva large, firm, cup-shaped. 661. *A. volvata* Pk.
(cc) Pileus glabrous except for occasional patches of the universal veil; volva sheathing, flabby.
(d) White. 662. *A. vaginata* Fr. var. *alba* Sacc.
(dd) Tawny-yellowish. 662. *A. vaginata* Fr. var. *fulva* Sacc.
(ddd) Gray to mouse-colored. 662. *A. vaginata* Fr. var. *livida* Pk.

(AA) Volva friable, floccose, etc., not membranous.
(a) Pileus orange to yellow, plicate-striate on margin; stem and gills pale yellow; volva thin and evanescent. *A. parcivolvata* Pk.
(aa) Pileus some other color.
(b) Pileus small, 2-3 cm. broad, pulverulent, striate, grayish to mouse-colored. *A. farinosa* Schw.
(bb) Pileus larger, with floccose patches or warts on its surface.
(c) Pileus white to pale yellowish, finely striate on the margin; volva ocreate, as in *Amanita pantherina*. *A. albocreata* Atk.
(cc) Pileus grayish-brown, sulcate striate, covered with mouse-colored warts; volva breaking up into sub-annular fragments on stem. 663. *A. strangulata* Fr.

Section I. Universal veil membranous, splitting at the apex; the volva vaginate or cup-shaped at the base of the stem, entire.

661. Amanitopsis volvata Pk. (Poisonous)

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Murrill, Mycologia, Vol. 5, Pls. 86 and 87, Fig. 2.

PILEUS 5-7 cm. broad, convex then plane, even or slightly striate on margin, *covered with fibrillose or floccose scales, whitish to brownish.* GILLS free, close, white. STEM 5-10 cm. long, 5-10 mm. thick, white to brownish-gray, equal or tapering slightly upward, stuffed, densely pulverulent-floccose or shaggy above the volva, *with a very large, persistent, membranous, firm, brown volva* sheathing the base. SPORES elliptic-oblong, 9-11 x 6-7 micr., smooth, white, granular within.

In open frondose woods, solitary. August-September. Detroit. Rare.

This is easily separated from *A. vaginata* by its oblong spores and floccose-scaly pileus. The volva is also more firm and ample. It is said to be identical with *A. agglutinata* B. & C. Our specimens were brownish throughout on cap and stem. The gills become dull-brown on drying. According to Peck the volva sometimes leaves patches on the pileus.

662. Amanitopsis vaginata Fr. (Edible)

Var. *alba* Sacc.
Var. *fulva* Sacc.
Var. *livida* Pk.
Syst. Myc., 1821. (As Amanita.)

Illustrations: N. Y. State Mus. Rep. 48, 1896, Bot. ed.
Atkinson, Mushrooms, Plate 23, p. 75, 1900.
Marshall, Mushroom Book, op. p. 54, 1905.
Hard, Mushrooms, Figs. 30 and 31, p. 44, 1908.
Bresadola, Fungh. mang. e. vel., Pl. 12.
Ricken, Blätterpilze, Pl. 75, Fig. 1.
Minn. Mushrooms, Fig. 5, p. 11, 1910.
Plates CXXV, CXXVI of this Report.

A composite species; according to the present custom including a number of *color forms,* here called varieties. The constancy of these varieties indicates that they could, with entire propriety, be referred to under species names, e. g., *Amanitopsis alba, Amanitopsis fulva,* and *Amanitopsis livida.* The description, however, applies equally well to all forms except as to color.

PILEUS 5-10 cm. broad, ovate to campanulate at first, then convex to plane, *glabrous* or rarely with fragments of the universal veil, slightly viscid when young or moist, *sulcate-striate* on the thin margin, *white, fulvous,* or *grayish-mouse color* in the corresponding varieties. FLESH white. GILLS free, white or whitish, close, broad, broadest in front, narrowed behind. STEM 8-18 cm. long, 4-8 mm. thick, rather slender, fragile, glabrous or mealy-squamulose, stuffed then hollow, subcylindrical, *base without a bulb* and inserted deep into the ground with the elongated, sheathing, flabby,

white VOLVA. SPORES spherical, 8-10 micr. diam., nucleate by a large oil-globule, smooth, white.

Solitary or scattered. In conifer or frondose forests; in open, low woods; in copses, sometimes on much decayed wood. July, August and September, rarely earlier or later. Throughout the State. Very common. *Edible.*

In some localities the white and tawny forms prevail, as at Ann Arbor; in others, especially in conifer regions, the tawny and livid forms are found more commonly. The pileus and stem are rather fragile, and the volva is apt to break and adhere to the soil so that the extracted stem appears to be without a volva. The variation in size and color seems to be greater in Europe than with us; Secretan differentiated ten forms and raised them to the rank of species. The spores of our plants, at least of the fulvous form, are always spherical, with an obscure angle on the apiculus side. Saccardo gives them ovate and 10-15 micr. long, and Patouillard figures them ovoid. Quelet and Battaile agree with us, calling them spherical and 10 micr. diam. The gray form must not be confused with *Amanita spreta* Pk. which is also without a bulbous stem. The beauty and symmetry of the different forms are a constant delight to the field botanist.

Section II. Universal veil breaking into floccose or powdery scales or fragments, which cover the pileus and base of stem.

663. Amanitopsis strangulata Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Marshall, Mushroom Book, p. 53, 1905.
N. Y. State Mus. Rep. 51, Plate 50, 1898.
N. Y. State Mus. Mem. 4, Plate 44, 1900.
Fries, Icones, Pl. II.
Gillet, Champignons de France, No. 11. (As *A. inaurata.*)
Patouillard, Tab. Analyt., No. 401.
Cooke's Ill., Plate 13.

PILEUS 5-10 cm. broad, ovate to campanulate at first, then convex to plane, slightly viscid when young or moist, *sulcate-striate* on margin, pale umber colored, *decorated with floccose, cinereous* to *mouse-gray scales or warts*, the remnants of the veil. GILLS free, close, white or ashy-tinged, broader in front. STEM 8-15 cm.

long, 5-12 mm. thick, equal or tapering upward, stuffed then hollow, subglabrous, or furfuraceous, white above, darker to pale umber *below where it is somewhat decorated by the fragments of the mouse-gray volva.* SPORES spherical, 9-12.5 micr., granular within.

Solitary or scattered. In mixed forests of hemlock, maple and yellow birch, of the northern part of the State. Bay View, Marquette, Houghton. July-September. Not infrequent at times. Edible.

It is remarkable that this species does not occur in the southern part of the State; at least I have never seen it there. Peck and McIlvaine say it occurs "in open grassy places, in wheat-stubble, etc." as well as in the woods, in Pennsylvania, New Jersey and West Virginia. So far I have seen it three different summers in the Northern Peninsula, always in hemlock woods.

The SPORES are not in entire agreement with the European measurements. With us they are spherical or nearly so. Saccardo is evidently in error when he says they measure 9-15 micr. and are ovate; Stevenson quotes Smith's measurements as 16 x 8 micr., and Boudier gives them as 12-13 micr. Peck considers it clearly distinct from *A. vaginata* and in the 51st Report has given an excellent account of the plant.

Lepiota Fr.

(From the Greek *lepis,* a scale.)

White-spored (except *L. morgani*); stem *fleshy, separable* from the pileus, provided with a persistent or evanescent *annulus;* gills *free* (except in some of the "granulosi" section).

Fleshy, firm or soft mushrooms, growing on the ground, on debris, or on more or less rotten wood in forests; large and small.

The PILEUS is scaly from the breaking up of the cuticle, rarely smooth, most often white, but also tinged yellow, brown or red; there are a few species with a viscid pileus. The STEM is stuffed or hollow, firm or soft, fleshy and different in texture from the trama of the pileus, and easily separable from it. The GILLS are white, but may change color in age or when bruised; (in *L. morgani* they become sordid-green from the greenish spores). They are usually free, but a small group has adnate or adnexed gills, although otherwise like the genus; e. g., *L. granosa, L. amianthina,* etc.

The VEIL is theoretically double, as in Amanita, but the outer

or "universal veil" is concrete with the pileus and does not split or break to form a volva on the stem or to form superficial patches on the cap. Sometimes it breaks away early at the base of the stem and is pulled up on the stem as the latter elongates, like a movable ring, as in *L. procera;* then again it breaks away only from the margin of the pileus, leaving a sheath on the stem terminated above by a flaring margin, as in *L. rugosa.* The inner veil is quite variable in texture, membranous to fibrillose, floccose or granulose; sometimes the delicate structure soon disappears or is washed away by the rain. The TASTE is mild, and all the large species except the green-spored *L. morgani* can be eaten with safety. Some of the smaller species, like *L. clypeolaria* Fr., *L. helvola* Bres. and *L. charcarias* are suspected. The SPORES are white in mass (except one species) and varying in shape, usually longish, sometimes subfusiform, often minute and then elliptical or ovate, in a few cases somewhat angled; they often mature slowly, so that measurements must be made with care.

The genus can be divided into three natural groups with reference to the character of the cuticle of the pileus or of the veil; these groups can be further subdivided into sections, as follows:

A. Cuticle of pileus glutinous or viscid; trama of gills divergent (= Limacella Earle):

I. Lubricae
II. Viscidae

B. Cuticle dry; annulus terminating a sheath or such other remnants of the veil as remain on the stem:

III. Clypeolariae
IV. Asperae
V. Granulosae

C. Cuticle dry; annulus independent, often movable; stem without any other remains of the veil:

VI. Subclypeolariae
VII. Procerae

Key to the Species

(A) Pileus viscid.
  (a) Pileus small, 2-5 cm. broad, stem slender.
    (b) Stem and pileus both very viscid or glutinous, white. 664. *L. illinita* Fr.
    (bb) Stem not viscid; pileus with a subviscid, thin separable pellicle, tinged pink. 667. *L. delicata* Fr. var.
  (aa) Pileus larger, 5-10 cm., and stem stout.
    (b) Pileus whitish to pinkish-tan, slightly viscid; stem fibrillose-glabrescent. 666. *L. fischeri* sp. nov.
    (bb) Pileus reddish-bay, viscid; stem scaly. 665. *L. glioderma* Fr.

(AA) Pileus not viscid.
(a) Growing in fields, pastures, gardens, lawns, and on decomposing vegetable matter (rarely in open woods); large to medium-sized.
(b) Annulus movable; plant very large.
(c) Plant taller than broad; spores white, 14-18 x 9-11 micr. 686. *L. procera* Fr.
(cc) Plant as broad or broader than tall; spores greenish, 10-13 x 7-8 micr. 687. *L. morgani* Pk.
(bb) Annulus not freely movable (except sometimes in *L. americana*).
(c) Plant assumes a dull reddish color when bruised or on drying; annulus rather large; spores 8-10 x 5-8 micr. 688. *L. americana* Pk.
(cc) Plant not changing as above.
(d) Stem thickened toward base like the seed-stalks of onions, densely caespitose. 680. *L. cepaestipes* Fr.
(dd) Stem not of the above shape.
(e) Gills becoming pink in age; pileus firm, medium large, white; stem with persistent annulus. 689. *L. naucina* Fr. (syn. *L. naucinoides* Pk.).
(ee) Gills remaining whitish; pileus *small*, rugulose, widely striate, whitish. *L. rugulosa* Pk.
(aa) Growing in forests, open woods, under copses, bushes, etc. (rarely on lawns); medium to small.
(b) With some shade of blue or purple, either when fresh or on drying; small.
(c) Gills, stem, flesh etc. changing to blue when drying; annulus membranous, persistent; pileus brownish-scaly. *L. caerulescens* Pk.
(cc) Gills, etc., not changing to blue when drying; annulus powdery, evanescent.
(d) Odor foetid; pileus lavender; stem dark brown to blackish below. *L. ecitodora* Atk.
(dd) Odor not foetid; plants small.
(e) Pileus whitish, covered with a heliotrope-purple, powdery substance; flesh tinged yellow. *L. purpureoconia* Atk.
(ee) Pileus whitish, tinged with blue around margin; flesh turning brownish where bruised. *L. cyanozonata* Longyear.
(bb) Without shades of blue or purple.
(c) Stem clothed with a floccose, squamose or filamentous sheath; pileus not granular nor mealy.
(d) Spores 12 micr. or more in length.
(e) Pileus and lower stem brown; spores truncate at base, with oblique apiculus. *L. geniculospora* Atk.
(ee) Pileus ochraceous or yellowish-white, sometimes reddish-tinged; spores subfusiform, 13-18 x 4-6 micr. 668. *L. clypeolaria* Fr. (*L. metulaespora* B. & Br.)
(dd) Spores less than 12 micr. long.
(e) Growing on rotten wood, small; pileus pale tawny to subalutaceous, floccose-scaly; spores 8-11 micr. long. 673. *L. acerina* Pk.
(ee) Growing on the ground, or among debris; spores usually smaller.
(f) Pileus medium size, with erect, tomentose or floccose wart-like scales; veil copious.
(g) Spores 7-9 micr. long.
(h) Gills crowded, much forked. 671. *L. friesii* Lasch.
(hh) Gills crowded, not forked. 670. *L. acutaesquamosa* Wein.
(gg) Spores 4-5 micr. long. 672. *L. asperula* Atk.
(ff) Pileus with *appressed*, tomentose, spot-like or patch-like scales.

(g) Annulus persistent; stem slender, about 1 mm. thick, blackish-brown. *L. gracilis* Pk.
(gg) Annulus evanescent or obscure.
(h) Pileus 4-8 cm. broad, patches tawny-olive; stem stout; spores attached at basal angle. *L. caloceps* Atk.
(hh) Pileus dark-brown, usually less than 4 cm. broad.
(i) Spores minute, 4 x 2 micr.; veil forming a dense, brown tomentum on stem. *L. eriophora* Pk.
(ii) Spores larger, 6-8 x 4-5 micr.; veil of more delicate and loose floccose filaments. 669. *L. felina* Fr.

(cc) Stem without evident sheath, but provided either with an evanescent or a persistent annulus. (See ccc.)
(d) Spores 9 micr. or more in length.
(e) Pileus moderately large, with red appressed scales; annulus persistent. 681. *L. rubrotincta* Pk.
(ee) Pileus small, minutely squamulose; annulus evanescent; base of stem mycelioid, forming a "sand-bulb." *L. arenicola* Pk.
(dd) Spores less than 9 micr. long.
(e) Pileus rather small, 1.5-4 cm. broad, with reddish-brown scales on a white surface; spores attached at basal angle; with a marked odor. 682. *L. cristata* Fr.
(ee) Pileus white, small, minutely fibrillose-squamulose; spores minute; annulus thin and fragile. 684. *L. miamensis* Morg.
(eee) Pileus with minute pale-yellow hairy scales. 683. *L. alluviinus* Pk.

(ccc) Stem clothed or peronate with squamulose, granular, furfuraceous, or minutely warty scales; pileus granular, warty or furfuraceous.
(d) Gills adnate.
(e) Pileus distinctly rugose on disk.
(f) Plant growing on rotten logs, stumps, etc., large; the sheath membranous-margined above. 674. *L. granosa* Morg.
(ff) Plant growing on the ground or on leaf-mould, small; the floccose-scaly sheath not margined above. 675. *L. rugoso-reticulata* Lorin.
(ee) Pileus not rugose.
(f) Stem long, slender; pileus often umbonate. *L. amianthina* Fr.
(ff) Stem short, stouter; pileus not umbonate. 676. *L. adnatifolia* Pk.
(dd) Gills adnexed or emarginate.
(e) Growing on rotten wood; color whitish to pale tawny. 678. *L. pulveracea* Pk.
(ee) On the ground; color rusty-yellowish. 677. *L. granulosa* Fr.
(eee) Like preceding but whitish throughout. 677. *L. granulosa* var. *albida*.
(ddd) Gills free; plants quite small; soft, fragile.
(e) Pileus dingy-white, or brownish. 679. *L. pusillomyces* Pk.
(ee) Pileus white, disk pinkish. 685. *L. cristatatellus* Pk.

Section I. Lubricae. The young plant enclosed in a universal glutinous veil. The trama of the gills divergent.

664. Lepiota illinita Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 16, Fig. 1.
Patouillard Tab. Analyt., fasc. VII, No. 609.
Gillet, Champignons de France, No. 425.

PILEUS 2-6 cm. broad, thin, soft, ovate then campanulate-expanded, subumbonate, *glutinous* (moist), *glabrous, white,* or whitish, even or substriate on margin. GILLS free, close, moderately broad, white, soft, trama divergent. STEM 5-8 cm. x 3-6 mm., white, glutinous, equal, stuffed to hollow, not scaly. FLESH white, soft, thin. SPORES 4-6 x 3-4 micr., subglobose to ovoid, smooth, white. TASTE and ODOR none. ANNULUS obsolete, glutinous.

Singly or gregarious. Ground, white birch woods near Marquette. Elm and maple woods, southern Michigan. September.

Known by its glutinous and slimy cap and stem. The European plants are a little larger.

Section II. Viscidae. Surface of pileus provided with a continuous gelatinous, separable pellicle; stem dry. Trama of gills divergent (except in *L. delicata*).

665. Lepiota glioderma Fr.

Monographia, 1857.

Illustration: Cooke, Ill., Pl. 118 A.

PILEUS 2-5 cm. broad, obtusely convex, *viscid, reddish-bay* fading to dull ferruginous, glabrous, even, cuticle separable. FLESH thin, white or tinged rufous. GILLS close, *broad,* subventricose, white, free but reaching apex of stem by a point, edge very even, trama divergent. STEM 5-7 cm. long, 4-6 mm. thick, *dry,* covered with *reddish-floccose scales* up to the slight ANNULUS, equal or attenuated downwards, solid, fibrous. SPORES globose, 4-5 micr.

diam., smooth; basidia 4-spored; no cystidia. TASTE farinaceous. ODOR none.

(Dried: Cap and gills brownish-tan to fuscous.)

Singly or few. Debris on ground, in hemlock, maple or birch woods. Marquette, Houghton, Bay View and New Richmond, apparently limited to conifer territory. August and September. Infrequent.

This Lepiota approaches the genus Armillaria in appearance, but the gills are not attached to the stem. The annulus is sometimes well-developed and flaring.

666. **Lepiota fischeri** sp. nov.

Illustration: Plate CXXVII in this Report.

PILEUS 4-9 cm. broad, convex-campanulate, obtuse, even, *subviscid,* cuticle separable and continuous, fleshy, rather soft, *white to pale alutaceous.* FLESH white, thick, rather soft. GILLS crowded, rather narrow, free and somewhat remote, plane, white, edge entire. STEM 4-10 cm. long, 4-10 mm. thick, subbulbous, somewhat curved, *striate,* fibrillose, *solid, firm,* fibrous-fleshy, separable from pileus. ANNULUS superior, large, membranous, at length pendulous, white, subpersistent, fragile. SPORES minute, 3-4 x 2-3 micr., smooth, oval; *basidia* small, with 1 to 2 long sterigmata, (5-7 micr. long), rarely 3 or 4, rarely also a forked sterigma, tramal hyphae of gills divergent. TASTE slight; odor becoming strong on drying, like that of *Tricholoma sulfureum.*

(Dried plants: Pale alutaceous, gills brownish.)

Gregarious. On ground in low frondose woods. Near Detroit. September and October. Infrequent.

Related to *L. lenticularis* (*Amanita lenticularis* Fr.), and is perhaps its American counterpart. Our plants differ in lacking the dark green drops oozing from apex of stem and annulus, (see Quelet and Battaile, Flora Monographic des Amanites et des Lepiotes, 1902), and in character of stem which is said to be stuffed or hollow and floccose-scaly in the European plant. Quelet, Ricken and Battaile give the spores 6 to 8 micr. It also differs from *L. persoonii* Fr. in stem and gill characters. I have dedicated it to the energetic student of mushrooms, Dr. O. E. Fischer of Detroit, who found it.

667. Lepiota delicata Fr. var.

Syst. Myc., 1821.

Illustration: Fries, Icones, Pl. 15, Fig. 2.

PILEUS 2-4 cm. broad, thin, subumbonate, campanulate-expanded, with a continuous, separable, *subviscid cuticle,* delicately *pink-colored,* sometimes shading to white on margin, even, radiately innately silky. FLESH pure white, *unchanged* when bruised, thin, fragile. GILLS narrow, close, free, somewhat remote, pure white. STEM 5-9 cm. long, 3-5 mm. thick, tapering upwards from a subclavate bulb, dry, *glabrous,* curved or straight, soft, stuffed. ANNULUS membranous, thin, subpersistent, white, median, at length pendant. SPORES 5-6.5 x 3-4 micr., elliptical, subacute at ends, white, smooth. CYSTIDIA on edge of gills subcylindrical, clustered, numerous, 7 x 4.5 micr., none on sides of gills; basidia 4-spored. ODOR and TASTE none.

(Dried: Annulus *snow-white,* stem and gills pale alutaceous, cap pink with brownish umbo.)

Gregarious. On the ground in swampy woods of elm, etc., also under hemlock in ravines. New Richmond. September. Infrequent.

L. oblita Pk. differs in its viscid stem and more tawny pileus; the spores are similar. It is apparently much like *L. incarnata* Clem. and *L. rufescens* Morg. The presence of a separable gelatinous cuticle, the unchangeable flesh, and the cystidia distinguish it from these. A hot-house variety is said to occur in Europe.

Section III. Clypeolariae. Stem clothed at first by a floccose or filamentous sheath. Pileus pruinose, floccose or appressed scaly, the cuticle at first continuous.

668. Lepiota clypeolaria Fr. (Suspected)

Sys. Mycol., 1821.

Illustrations: Fries, Icones, Pl. 14, Fig. 2.
N. Y. State Mus. Rep't. 54, Pl. 76, 1901.
Gillet, Champignons de France, No. 416.
Ricken, Blätterpilze, Pl. 85, Fig. 2.
Plate CXXVIII of this Report.

PILEUS 2-5 cm. broad, campanulate-convex to expanded, obtuse

or umbonate, floccose-scaly, even or striate beneath the scales on margin when old, color of scales variable: white, yellowish, rufous-ochraceous or ochre, the disk often darker, brown or reddish-brown, white beneath scales, margin often appendiculate from remnants of the veil. FLESH white, thin, *flaccid.* GILLS free, close, white, narrower in front, edge minutely flocculose. STEM slender, 3-10 cm. long, 3-5 mm. thick, equal or tapering upward, sheathed up to the evanescent, floccose annulus, by soft, loose, floccose, white or yellowish scales or tomentum, hollow, fragile, whitish under scales and at apex. SPORES very variable in size, even in the same specimen, 10-16 x 4-6 micr., subfusiform, elongated-elliptical, broader at the distal end or symmetrical, etc., smooth, white.

(Dried: Pileus pale ochraceous or rufous-tan; stem covered by a *white* floccose sheath.)

Scattered. Ground or debris in woods. Marquette, Bay View, Ann Arbor, New Richmond; throughout the State. July to October. Frequent.

There is much uncertainty among all mycologists concerning the limits of this species. *L. metulaespora* is said to be a very similar plant. Studies so far made, both of the European and American plant, seem to have increased the confusion. Some (Morgan, Mycol., Vol. 12) give the spores of *L. clypeolaria* 15-20 x 5-6 micr., and *L. metulaespora* 9-12 x 4-4 micr. Others (Beardslee, Jour. Mycol., Vol 13, p. 26, 1907) reverse this. The spore-sizes of the Michigan specimens overlap both. I have so far found none with spores 18-20 micr. long, but, of course, shorter, immature spores are always present. Most European authors omit the spore-size of *L. clypeolaria* Massee (Massee, European Fungus Flora Agaricaceæ, 1902) gives 15-16 micr. for *L. metulaespora,* which is close to ours; for *L. clypeolaria,* he gives 6 micr. Peck (Peck, N. Y. State Mus. Rep. 54, 1901, p. 173) has come to the conclusion that there is no essential difference except the striatious on the cap of *L. metulaespora;* this is hardly a specific distinction. A number of varieties have been split from these species, (Quelet & Battaille, Flore des Amanitos et des Lepiotes, 1902, p. 66) and they are evidently very variable in color, and this may be true of the spores within certain limits. For the present we will use one name for all the forms.

669. Lepiota felina Fr.

Hym. Europ., 1874.

Illustrations: Pat., Tab. Analyt., No. 505.
Ricken, Blätterpilze, Pl. 86, Fig. 3.

PILEUS 3-5 cm. broad, campanulate-convex, subumbonate, whitish under the numerous subtomentose or floccose *blackish scales.* FLESH white, thin. GILLS free, close, rather narrow, white. STEM slender, equal or tapering upward, base with slight bulb, hollow, whitish, clothed below by floccose, brown or blackish scales. ANNULUS slight, evanescent, inferior or median, sometimes tinged black on edge. SPORES 6-8.5 x 4-5 micr., elliptic-ovoid, white; basidia 4-spored.

On the ground, hemlock woods. Bay View. August-September. Infrequent or rare.

Distinguished from *L. clypeolaria* by its spores, from *L. cristata* by the blackish scales and floccose stem. SPORES 8-10 x 3-4 micr., as given by Ricken. The Michigan plant may be *L. fuscosquamea* Pk.

Section IV. Asperae. Pileus fibrillose-scaly at first, then with pointed, or pyramidal or fasciculate, erect or squarrose scales or warts; stem variously sheathed or glabrescent.

670. Lepiota acutæsquamosa Fr.

Epicrisis, 1836-38.

Illustrations: Hard's Mushrooms, Fig. 38, p. 55 (from Michigan plants).
Gillet, Champignons de France, No. 409.
Michael, Führer f. Pilzfreunde, III, No. 122.
Ricken, Blätterpilze, Pl. 86, Fig. 1 (as *L. friesii*).

PILEUS 5-15 cm. broad, soft, at first subhemispherical then convex-expanded, obtuse, even, at first covered by a soft tawny or pale umber tomentum which usually breaks up into brown or rufous-brown, *pointed, pyramidal, erect scales or warts,* the tips of which become blackish, are crowded and darker on disk, the cracks showing the white flesh beneath, margin extending beyond gills. FLESH white, moderately thick. GILLS *crowded,* free, rather

narrow, thin, not forked, white becoming dingy, edge serratulate. STEM 6-12 cm. long, 6-12 mm. thick above, tapering upward from a bulbous base, sometimes equal and subbulbous, stuffed to hollow, soft, whitish, at first covered by the fibrils of the veil, with scattered brown squamules, terminating in a floccose-fibrillose, often oblique and broken, rather evanescent ANNULUS. SPORES elongated oblong, smooth, white, 7-9 x 2.5-3 micr. ODOR and TASTE not marked.

(Dried: Cap, gills and stem alutaceous to wood-brown.)

Gregarious. On the ground or on very rotten wood in forests, on flowerbeds, conservatories, etc. Ann Arbor, Bay View, New Richmond. September. Frequent.

Much the appearance of the next two species; separable with certainty from *L. friesii* by its entire gills, from *L. asperula* by the spores. The veil is composed of silky filaments woven into a membrane which is at length lacerated vertically so as to appear like a "cortina" of the genus Cortinarius.

671. Lepiota friesii Lasch.

Epicrisis, 1836-1838.

Illustrations: See Hard's Fig. of *L. acutaesquamosa,* which it imitates in appearance.
Marshall, Mushroom Book, 1902, op. p. 65.

The description of the preceding species is sufficient for all the characters except the following: GILLS very narrow, *abundantly forked,* very crowded. SPORES 6-9 x 2 micr., narrowed at one end, smooth, white, elongated-oblong to subfusiform. Sterile cells on edge of gills as in the preceding species. Habitat, etc., same as in *L. acutaesquamosa.*

Ann Arbor, Houghton, Munising, New Richmond.

The spores in our plants are narrower than in *L. acutaesquamosa,* which may be a constant character. The forking of the crowded gills is very marked. The pointed warts are crowded on the disk, or may be scattered over the entire surface of the pileus, and easily rubbed off.

672. Lepiota asperula Atk.

Atkinson, Mushrooms, p. 82, 1900.

Illustration: Ibid, Pl. 26, Fig. 84, p. 82.

PILEUS 1-4.5 cm. broad, campanulate-convex to expanded, obtuse, "hair-brown to olive-brown" or ochraceous-brown, cuticle breaking up into erect, rather pointed, blackish-brown warts, more numerous on disk, sometimes *subconcentrically rimose,* not striate. FLESH white, thickish, scissile, rather fragile. GILLS free, rather narrow to medium width, crowded, white becoming dingy, not forked, edge minutely eroded. STEM 2-6 cm. long, 4-6 mm. thick, *cylindrical* above the bulbous base, stuffed by fibrils, then hollow, covered at first by the loose, silky or fibrillose veil which collapses at the pileus and terminates on the stem by an evanescent ANNULUS, glabrous or fibrillose above annulus, below annulus sometimes minutely brown-squamulose. SPORES *minute,* 4-5 x 2-3.5 micr., oblong, smooth, white. Basidia 4-spored; sterigmata slender. No cystidia. ODOR and TASTE not marked.

(Dried: Like *L. acutaesquamosa* and *L. friesii.*)

Gregarious. Hemlock or mixed woods, on the ground among debris. Bay View, New Richmond. August-September. Infrequent.

Differs from *L. acutaesquamosa* in minute spores, and smaller size. Probably often confused with that species and difficult of separation from it. The veil is sometimes quite copious and cobwebby.

673. Lepiota acerina Pk.

N. Y. Mus. Rep. 51, p. 283, 1898.

PILEUS 1-2.5 cm. broad, convex then expanded, covered with tawny or pale rufous-brown, appressed, fibrillose or floccose scales, darker and erect and pointed on the disk, margin even. FLESH thin, white. GILLS free, close, thin, rather broad, white or whitish, edge minutely fimbriate. STEM 2-4 cm. long, 1.5-4 mm. thick, stuffed to hollow, equal or slightly bulbous, covered up to the obsolete ANNULUS by small, dark, fibrillose scales colored like those of pileus. SPORES 8-11 micr. long, 3-4 micr. wide, obliquely apiculate and truncate at one end, narrowed toward other end, smooth, white; sterile cells on edge of gills clavate.

(Dried: Pileus and gills umber or fuscous-brown.)

Gregarious. On very decayed wood, in woods of maple, birch, hemlock, etc. Houghton, Munising, Bay View, New Richmond. July, August and September. Infrequent.

Shape of spores like those of *L. boudieri* Bres. (see Tab. XLVI, Fungi Trid.), but different in other respects. *L. cristata* has similar spores.

Section V. Granulosae. Pileus and stem granular, furfuraceous, pulverulent or minutely warty.

674. Lepiota granosa Morg.

Jour. Cincinnati Soc. Nat. Hist., 1883.

Illustrations: Marshall, Mushroom Book, Pl. 12, op. p. 63, 1905.
Hards, Mushrooms, Pl. VIII, Fig. 36, p. 52.
Plate CXXIX of this Report.

PILEUS 5-9 cm. diam., ovate then convex-expanded, umbonate or obtuse, ochraceous to fulvous, *furfuraceous-granulose, rugose-wrinkled* to almost even, margin regular or undulate. FLESH thick, whitish or tinged ochraceous. GILLS narrow, *crowded, adnate,* sometimes subarcuate, whitish to ochraceous. STEM 5-10 cm. long, 8-15 mm. thick, equal or tapering upward from the clavate base, straight or curved, fibrous-stuffed to hollow, *peronate* by furfuraceous or floccose scales, colored like the pileus and terminating above in a *rather large, flaring or reflexed, membranous, persistent* ANNULUS, yellowish within, pallid or brownish above the annulus. SPORES smooth, white, 4-5 x 3 micr.

Gregarious or subcaespitose. On rotten wood; maple, birch and beech woods. Marquette, Bay View. September. Infrequent.

In size, it stands at the head of this group. It is easily known by its large, persistent annulus. It differs from *L. amianthina* in size and the character of sheath and annulus.

675. Lepiota rugoso-reticulata Lorin.

Oest. Bot. Zeitschrift, 1879.

PILEUS 1-4 cm. broad, convex, *rugose-reticulate,* covered with dense, glistening granules, pale cinnamon-brown, *tinged reddish,*

mostly unicolorous, margin appendiculate. FLESH thick, *white.* GILLS adnate, sometimes subdecurrent, crowded, rather narrow, whitish, edge entire. STEM 4-7 cm. long, 3-4 mm. thick, equal or tapering upward, *solid,* peronate with cinnamon- or reddish-brown floccose scales, terminating in an *incomplete or obsolete* ANNULUS, pallid above, white-mycelioid at base. SPORES 4-5.5 x 3 micr., smooth, ovoid, apiculate. ODOR not noticed.

(Dried: Pileus pale brick-red, gills alutaceous, stem white-mycelioid at base.)

Gregarious. On mosses, low woods of white birch in northern Michigan, elm, etc., in south. Ann Arbor, Marquette. August-September. Infrequent.

This species resembles *L. granulosa* in color, etc., but differs in its slender stem and rugose pileus; it approaches *L. granosa* in pileus characters but is small and the annulus is rarely persistent. It differs from *L. amianthina* in its lack of an umbo, and its small spores.

676. Lepiota adnatifolia Pk.

N. Y. State Mus. Bull. 54, p. 947, 1902.

PILEUS 2.5 cm. broad, broadly convex, granulose to warty or scaly on disk, dark *ferruginous-red,* not umbonate, even, margin appendiculate. FLESH white. GILLS *adnate,* close, narrow, thin, whitish, edge entire. STEM 2-4 cm. long, 4-6 mm. thick above, tapering upward from a clavate base, solid, peronate by reddish or whitish squamules, and terminating in an evanescent *annulus,* apex white or tinged pink. SPORES minute, 3-5.5 x 2.5-3 micr., oval-oblong, slightly curved in one view. CYSTIDIA very slender, hyaline, about 50 micr. long, 3 micr. thick, subcylindrical, apex capped by conical covering, sometimes infrequent or entirely lacking, on edge and sides of gills. ODOR slight.

On debris or decayed logs in woods of hemlock, maple, etc. New Richmond, Ann Arbor. September-October. Rare.

Differs from *L. amianthina* and *L. granulosa* in the presence of cystidia and lack of an umbo, and by its color. The spores are smaller than given by Peck. The main part of the cap is covered closely with appressed, flat, tomentose warts.

677. Lepiota granulosa Fr.

Syst. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 611.
Ricken, Blätterpilze, Pl. 81, Fig. 3.
Cooke, Ill., Pl. 18, Vol. I.

PILEUS 3-6 cm. broad, ovate then convex-expanded, obtuse or subumbonate, *furfuraceous-granular,* often radiately wrinkled, ochraceous *tinged brick-red,* but varying to buff or dark-rufous with a hoary lustre. FLESH thin, white, rufescent. GILLS *adnexed, rounded behind,* close, medium width, white. STEM short, 2-5 cm. long, 4-8 mm. thick, stuffed to hollow, equal or tapering upward, granulose to floccose-scaly and pale reddish up to the *slight* evanescent annulus, whitish at apex. SPORES minute, 4-5 x 3-3.5 micr., ovate, smooth; cystidia none.

(Dried: Cap and scales of stem rufous-ochraceous, gills ochraceous-alutaceous.)

Gregarious to subcaespitose. On leaf-mould, mosses, etc., in open woods of maple, oak, hemlock, etc. Ann Arbor, Marquette, New Richmond. August-October. Local but frequent.

The spores are smaller than given by Patouillard (Tab. Analyt.) and Quelet and Battaille (Flore des Am. et des. Lep.). Hennings in Engler & Prantl, however, gives the size as found in American plants. Also our plants are usually shorter and thicker stemmed than the figures of Patouillard and Cooke would indicate, i. e., the plant is more squat, except possibly when it grows in low, wet situations. It approaches other species, like *L. charcharias* and *L. amianthina,* which were formerly called varieties of it. There is a hoary sheen to the granularity on the cap, by which one may know it. The way the gills are attached distinguishes it from the three preceding species.

678. Lepiota pulveracea Pk.

N. Y. Mus. Rep. 54, p. 144, 1900.

"PILEUS 1-2.5 cm. broad, hemispheric then convex-expanded, *pulverulent* or minutely granulose and squamulose, even, tawny or paler. GILLS *adnexed,* close, thin, narrow, yellowish-white. STEM equal, hollow, sheathed with *delicate* brownish, small granulose

scales terminating in the obsolete ANNULUS, pruinose and whitish at apex." SPORES minute, oblong-elliptical, obscurely curved, smooth, white, 4-5.5 x 3 micr.

(Dried: Cap pale fulvous, stem paler with scattered floccose-squamules.)

Gregarious. On *moss* growing over an old hemlock log. Marquette. September. Rare.

The spores are not ovate as in *L. granulosa,* and the adnexed gills and color, etc., separate it from *L. rugoso-reticulata.* The dried specimens lack the rich tints of the others of this group.

679. Lepiota pusillomyces Pk.

N. Y. Mus. Rep. 28, p. 48, 1876.

Illustration: Ibid, Plate I, Figs. 1-3.

PILEUS 4-8 mm. broad, thin, convex, obtuse, furfuraceous or *covered with minute granular floccules,* white or nearly so, remains of veil clinging in granular flocs to edge of pileus. TRAMA of pileus composed of vesicular cells, pulverulence on surface also of thin-walled globular cells. GILLS *broad,* free, ventricose, moderately close, white. STEM 1-3 cm. long, 1-2 mm. thick, slender, equal, stuffed with fibrils, rufescent beneath the *white mealiness* which terminates at the obsolete ANNULUS. SPORES elliptic-oblong, 4-5 x 2.5-3 micr., smooth, white.

Single and scattered. On rich soil in woods. Ann Arbor, Bay View. August. Infrequent.

This is close to *L. seminuda* of Europe, and may be the same, unless the microscopic characters are shown to be different. Patouillard figures the spores of *L. seminuda* more ovate then elliptical, but other authors give the latter shape. This is a delicate Lepiota and approaches *L. cristatatellus* Pk. which is distinguished by the pinkish tinge usually present on the pileus, and the glabrous stem.

Section VI. Subclypeolariae. Pileus thin, minutely scaly, pruinose or pulverulent. Annulus membranous, persistent or evanescent. STEM for the most part glabrous or denuded.

680. Lepiota cepæstipes Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: N. Y. State Mus. Bull. 94, Pl. 87, 1905.
Hard's Mushrooms, Fig. 37, p. 54.
Gillet, Champignons de France, No. 414.
Michael, Führer f. Pilzfreunde, Vol. III, No. 94.
Plate CXXX of this Report.

PILEUS 2-8 cm. broad, thin, oval then campanulate-expanded, obtuse, soft, at length umbonate, *striate-plicate* and splitting on the margin, covered with minute, numerous, *mealy* or wart-like scales, which are often brown, elsewhere white. FLESH white. GILLS narrow, free, close, white then dingy, thin, edge pruinose. STEM 4-12 cm. long, 4-6 mm. thick at apex, tapering upward or often *somewhat ventricose,* flexuous, glabrous or occasionally with floccose particles, hollow, white. ANNULUS thin, membranaceous, subpersistent, white. SPORES oval-elliptical, smooth, white, 9-10 x 5-7 micr., nucleate. ODOR and TASTE mild.

Caespitose. On rich soil of gardens, conservatories, etc., decaying straw-piles, sawdust, stumps, or decomposing vegetable matter of any kind. Ann Arbor, Bay View, New Richmond. June-September. Not common. Edible.

Often in dense clusters. Sometimes the pileus is yellow-tinged. The name refers to the shape of the stem which often resembles the enlargement on the seed-stalk of the onion. The plants soon droop and collapse in the wind. Hennings (in Engler and Prantl) says this mushroom was introduced into Europe from Brazil and also states that at first there is a small *sclerotium.*

681. Lepiota rubrotincta Pk.

N. Y. State Mus. Rep. 35, p. 155.

PILEUS 2-6 cm. broad, ovoid then convex-expanded, obtuse or subumbonate, the unbroken cuticle at first even, and innately fibrillose and *uniform reddish-pink*, darker or reddish-brown on disk, *at*

length breaking up into appressed red scales and rimose. FLESH white, thin. GILLS free, narrow, tapering toward stem, crowded at first, less so after expansion, white, edge minutely flocculose. STEM 4-9 cm. long, 3-8 mm. thick, tapering slightly upward or clavate at base, stuffed then hollow, even, *easily splitting lengthwise,* silky-fibrillose or glabrous. ANNULUS *well-developed,* membranous, persistent, edge thickish and often tinged red. SPORES 9 x 5 micr., but variable, often larger, narrow-elliptical, apiculate; CYSTIDIA on edge of gills about 36 x 6 micr.

(Dried: Color of cap red, gills dingy white, stem pale fuscous.)

Scattered or singly. On the ground among decaying leaves, mixed or hardwood forests. Ann Arbor, Detroit, New Richmond. August-September. Infrequent.

682. Lepiota cristata Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 83, p. 81, 1900.
Gillet, Champignons de France, No. 417.
Patouillard, Tab. Analyt., No. 504.
Ricken, Blätterpilze, Pl. 84, Fig. 3.
Cooke, Ill., 29.
Plate CXXXI of this Report.

PILEUS 1.5-4 cm. broad, thin, ovate then campanulate-convex or expanded, obtuse or umbonate, cuticle at first continuous, and entirely dull reddish or reddish-brown, then *broken into small concentric reddish-brown scales* except the darker umbo, the cracks white, margin often denuded of cuticle. FLESH white, thin. GILLS free, rather close, narrow to subventricose, white, edge minutely crenulate. STEM 3-5 cm. long, 2-5 mm. thick, slender, equal, hollow or stuffed with loose pith, glabrous or silky-fibrillose below ring, whitish or tinged dingy lavender, pinkish within. ANNULUS white, small, soon broken and deciduous. SPORES somewhat wedge-shaped, or angular, sometimes irregularly fusiform to oblong, depending on the view, white, 6-7 x 3-4 micr. ODOR rather disagreeable.

(Dried: Stem rufescent, pileus brownish to alutaceous.)

Gregarious. In grassy places or on the ground in low woods, etc., often on lawns. Marquette, Ann Arbor, Detroit, Houghton, New Richmond, etc. July-October. Common.

An effort was made by Morgan (Jour. of Mycol., Vol. 12, p. 244, 1906), to separate this into two species, *C. cristata* Fr. and *C. angustana* Britz. The separation was based on the spores and odor. Our plants sometimes have angular spores and no odor, and the spores vary, even in the same plant. Atkinson (Mushrooms, 1900, p. 92) has already pointed out that they are identical. The odor seems to be strong, weak or absent under different conditions. The pileus may be as much as 5 cm. across.

683. Lepiota alluviinus Pk.

N. Y. State Mus. Rep. 35, p. 157, 1884.

"PILEUS 1-3 cm. broad, thin, convex or plane, sometimes reflexed on margin, *white, adorned with minute pale-yellow hairy or fibrillose scales.* GILLS free, thin, close, white or yellowish. STEM 2-4 cm. long, 2-3 mm. thick, slender, fibrillose, whitish or pallid, slightly thickened at the base. ANNULUS slight, subpersistent, often near the middle of the stem. SPORES elliptical, 6-7.5 x 4-5 micr."

Alluvial soil among weeds and shrubs. East Lansing. August. Reported by Longyear.

"In drying the whole plant assumes a rich yellow hue."

684. Lepiota miamensis Morg.

Jour. Cincinnati Soc. Nat. Hist., 1883.

PILEUS 2-4 cm. broad, soft, convex-expanded, subumbonate, even, *fibrillose-scaly* except disk, *white,* disk sometimes brownish. FLESH white, very thin, fragile. GILLS free, *rather broad,* rounded behind, ventricose, *white.* STEM 3-5 cm. long, 2-4 mm. thick, slender, hollow, subequal, glabrous or pruinose at apex, often compressed, *white.* ANNULUS thin, fragile, subpersistent, *median.* SPORES oblong-oval, 5-6 x 3-3.5 micr., white.

(Dried: Pileus whitish, with brownish center, gills dingy-white, stem pallid.)

Singly or few. On the ground in rich woods among leaves. Ann Arbor. September. Rarely found.

Apparently similar to *L. alluviinus,* differing in lack of yellow color, especially on drying, and rather broad gills.

685. Lepiota cristatatellus Pk.

N. Y. State Mus. Rep. 31, p. 31, 1879.

PILEUS 5-8 mm. broad, soft, oval then convex, covered by minute granular-mealiness, *at first tinged pink all over,* then white with pinkish disk, margin mealy. GILLS free, white, medium broad, rounded behind, subventricose, *subdistant.* STEM 2-3 cm. long, 1 mm. thick, slender, equal, hollow or stuffed with fibrils, whitish, subglabrous below the *evanescent* ANNULUS, pruinose above. SPORES minute, subelliptical, 4-5 x 3 micr., smooth, white.

Scattered. In low, moist woods, on mosses, etc. Ann Arbor, Bay View, New Richmond. September. Frequent.

A small Lepiota, near *L. pusillomyces,* from which the pink of the cap and the white stem seem to distinguish it so that the two are quite easily recognized in the field. *L. cristatellus* is also said to have narrower gills, and its stem is usually glabrous, while *L. pusillomyces* has broad gills and a mealy stem below the annulus.

Section VII. Procerae. Pileus thick and fleshy, the cuticle commonly broken into large scales (continuous in *L. naucina* in most cases); annulus thick, mostly movable.

686. Lepiota procera Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Pl. 25, Fig. 81, p. 79.
Peck, N. Y. State Mus. Rep. 48, Pl. 18, 1896.
Hard, Mushrooms, Pl. VI, Fig. 32, p. 46.
Freeman, Minn. Plant Diseases, Fig. 18, p. 39, 1905.
McIlvaine, Amer. Fungi, Pl. XIII, p. 34.
Fries, Sverig. ätl. u. gift. Svamp., Pl. 3.
Michael, Führer f. Pilzfreunde, No. 53.
Gillet, Champignons de France, No. 429.
Ricken, Blätterpilze, Pl. 83, Fig. 1.
Plate CXXXII of this Report.

PILEUS 8-15 cm. broad, elliptic-ovate before opening, then campanulate-convex to subexpanded, *umbonate,* at first covered with a reddish-brown or umber-brown *cuticle, which breaks up into large brown scales or patches* during expansion of pileus, with smaller floccose scales between and exposing the white flesh beneath, cuticle

on umbo often continuous. FLESH thick, white. GILLS free, remote from stem, *broad anteriorly,* narrowed behind, thin, close, white or tinged pink, brownish in age, edge flocculose. STEM *15-30 cm. long,* cylindrical or tapering upward from a bulb, 6-12 mm. thick above, apex sunk deep into the flesh of the pileus as into a socket, hollow or stuffed with delicate long fibrils, *surface layer breaking up into small brownish scales,* or furfuraceous so as to appear variegated, white beneath and within. ANNULUS *movable,* thick, formed of the firm, membranous veil which breaks away early, its outer and lower surface covered with small brown scales, representing a continuation of the cuticle of the pileus at a very early state. SPORES 14-18 x 9-12 micr., elliptical, smooth, white; no cystidia found. Sterile cells on edge of gills, numerous, 35-45 x 10-15 micr., subcylindrical.

(Dried: Pileus buff with fuscous scales, stem pale fuscous, gills dingy-buff.)

Solitary or gregarious. On the ground, in meadows, pastures, open woods, or preferably in pastured clearings. August, September, October. Throughout the State. Edible.

Its long stem, movable annulus and *shaggy, spotted cap,* distinguish it from all others. Its height is often surprising, sometimes reaching a foot and a half, with a cap six to ten inches broad. Its cap is delicious, when after removing the scales, it is fried in butter. Its distribution is world-wide.

687. **Lepiota morgani** Pk. (Poisonous)

Botanical Gazette, Vol. 4, 1879.

Illustrations: Hard, Mushrooms, 1908, Pl. VII, Fig. 35, p. 50.
McIlvaine, Amer. Mushrooms, 1900, Pl. XIV, p. 36.
Plates CXXXIII and CXXXIV of this Report.

PILEUS 10-20 cm. broad, at first globose then convex and expanded, cuticle at first continuous, buff to pale umber, soon *broken up* except on disk, *into irregular scales or patches;* which are drawn apart and disappear in part. FLESH thick, firm, white. GILLS free, remote (4-5 mm.) from stem, close, rather broad, ventricose, *at first white then changing to dull green.* STEM *stout,* 10-20 cm. long, 1-2 cm. thick above, 2-4 cm. at base, tapering upward from a clavate base, stuffed with fibrils, *hard and firm,* glabrous, whitish or grayish-white to pale umber. ANNULUS thick, *mov-*

able, superior, toughish but soft. SPORES bright to dull *green in mass,* subelliptical, obliquely apiculate, 9-12 x 6-8 micr., nucleate.

Gregarious, often in large fairy rings. In meadows, pastures and open woods. In southern Michigan, Ann Arbor. Frequent but local.

Unsafe. Eaten with impunity by some persons, but others suffer vomiting, etc. This is our largest-capped meadow mushroom known; it attains a diameter of 14 inches. Its *large size, movable ring* and *greenish spores and gills* distinguish it. The underside of the ring next to the stem is at first covered by the remains of the cuticle which was continuous with the pileus. All the cuticle of the pileus except the center may disappear. The young margin of the cap is beautifully torn-serrate and floccose at first. Reports have come in that the whole plant is sometimes green or greenish.

688. Lepiota americana Pk. (Edible)

N. Y. State Cab. Rep. 23, p. 71, 1872.

Illustrations: N. Y. State Rep. 49, Pl. 44, 1896.
Atkinson, Mushrooms, Fig. 82, p. 80, 1900.
Hard, Mushrooms, Fig. 34, p. 49, 1908.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 6.
McIlvaine, Amer. Mushrooms, Pl. XV, p. 48, 1900.

PILEUS 3-10 cm. broad, ovate then convex-expanded, umbonate or subumbonate, cuticle at first reddish-brown and continuous, *then broken up* except on umbo into large, scattered, *reddish or bay-brown scales,* elsewhere white when young and fresh but *becoming dingy-red in age,* more or less striate on margin. FLESH thin, white, *reddening when bruised or in age.* GILLS free, close, rather broad in front, narrowed behind, white. STEM 7-12 cm. long, 4-6 mm. thick at apex, *tapering upward from a clavate base,* sometimes fusiform, stuffed then hollow, glabrous, white becoming reddish where handled. ANNULUS rather large, membranous, flaccid, sometimes movable, sometimes evanescent. SPORES elliptic-ovate, 8-10 x 5-7 micr., nucleate, white. ODOR and TASTE mild.

(Dried: Whole plant tinged dull red or smoky-red.)

Solitary to caespitose. On rich soil in grassy places, in fields or around old stumps. Ann Arbor and Ludington. August. Apparently rare in Michigan. Edible.

Bresadola (Tab. Analyt., Vol. 2, p. 83) suggests that our plant is

the same as the European *L. haematosperma* (*Agaricus haematosperma* of Hymen. Europ.), as well as *L. badhami* Berk. In these also the flesh changes to reddish in age or on drying. The French mycologists (Quel. and Battaile, Aman. et Lep., 1902, p. 73) have taken exception to this view, claiming that *L. haematosperma* actually has reddish or purplish spores when mature, while *L. badhami* has white spores. Hence the American name must be retained. Our plants can be distinguished from our other Lepiotas by this character of the flesh. The shape of the stem imitates at times that of *L. cepaestipes,* being enlarged just above the base, sometimes, however, it merely tapers from the very bottom; in the former case the base is sometimes short-pointed. The pileus is sometimes almost entirely white when fresh. The gills and flesh may assume a yellow tinge at first.

689. Lepiota naucina Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: N. Y. State Mus. Rep. 48, Plate 19, 1896.
Gillet, Champignons de France, No. 428.
Atkinson, Mushrooms, Figs. 79-80, p. 76-78.
Bresadola, Fungh. mang. e. vel., Pl. 15.
McIlvaine, Amer. Mushrooms, Plate XV, p. 44.
Ricken, Blätterpilze, Pl. 84, Fig. 2.
Plates CXXXV, CXXXVI of this Report.

PILEUS 4-8 cm. broad, at first subglobose to ovoid, then convex to subexpanded, obtuse, soft, *glabrous,* rarely broken into scales on the surface, white or smoky-white. FLESH white, thick, rather firm, abruptly thin on margin. GILLS free, not remote, close, moderately broad, narrowed behind, white at first, *slowly changing to pinkish then dingy-brown,* edge minutely flocculose. STEM 5-10 cm. long, 6-12 mm. thick above, tapering upward from a thickened base, sometimes subequal, stuffed then hollow, glabrous or silky below the ring, pruinose above, *white within and without.* ANNULUS formed from the membranous veil and outer layer of stem; the latter is shown peeled off up to the ring in the section of the young plant in our illustration. It is white, rolled together in the form of a collar, persistent and superior, in age it often becomes movable. SPORES elliptic-oval, 7-9 x 5-6 micr., but variable, some longer, occasionally abnormal and then spherical, nucleate, smooth, white. ODOR and TASTE mild.

Gregarious. Grassy ground, in pastures, fields, roadsides, and parks. Ann Arbor, Marquette, New Richmond, etc. September-November. Common throughout the State. *Edible.*

(Dried: Gills pale cinnamon-brown to umber, pileus smoky-buff, stem buff tinged umber or fuscous-brown.)

It seems to be agreed that there is an European plant like ours with elliptical spores. (Beardslee, Jour. Mycs., Vol. 13, p. 27, 1907.) Whether there is also one in Europe with uniformly globular spores is as yet uncertain. (Morgan, Jour. Mycs., Vol. 13, p. 10.) Our species will probably be known henceforth as *L. naucina* instead of *L. naucinoides* Pk., a name it has held so long. The spores vary remarkably in some individuals, while in others they are quite constant. All our specimens had mostly elliptical-oval spores; in some cases a few spheroid spores were present, but such occur in other mushrooms, and must be considered abnormal. This is one of the best mushrooms for the table. Its white gills and veil when young might lead the novice to think it to be an Amanita. The stem is firmer and lacks remnants of a volva, and the gills turn brown when heated or toasted, while in Amanita they remain white" (McIlvaine). It is not infested by larvae, and some method of cultivation is awaited eagerly by mushroom gardners. *Lepiota excoriata* Fr., as figured by Bresadola, has the same general appearance, but differs in the torn surface of the cap near its margin, in the bulblet at the base of the stem and in the much larger spores, which measure 15-17 x 9 micr.

Armillaria Fr.

(From the Latin, *armilla,* a ring.)

White-spored. Stem continuous with the hymenophore, provided with an *annulus.* Volva none. Gills adnexed, adnate or decurrent, partly with a diverging trama.

Fleshy, often compact, firm mushrooms; either terrestrial or on wood; mostly autumnal.

The PILEUS is either viscid or dry, glabrous or scaly, often provided with a separable pellicle; the surface sometimes cracked in dry weather. Most of the rarer species are large and stout, the pileus of dull shades of color: whitish, yellowish, brownish or reddish. The margin is often incurved. The scales on the pilei of some species represent the broken cuticle which is continuous with the veil but concrete. The GILLS are variously attached, and

Fries used this character to subdivide the genus into three groups, e. g., Tricholomata, with sinuate-adnexed gills; Clitocybae, with gills attenuated behind and subdecurrent; Collybiae, with gills equal. No examples of the Collybiae are known from the State. The stems of these three groups are normally central. With Patouillard (Les. Hymen. Eur., p. 95) it seems to me desirable to include here a fourth group: the Pleurotoidae, with eccentric or lateral stem, to include the species *Armillaria dryina* and *Armillaria corticata*. The gills are usually white but may turn yellowish or become stained in age, depending on the species. Some species possess a gill-trama with diverging hyphae, but in other species the hyphae are parallel. The relationships shown by this character in this genus are not yet very clear. The STEM is usually stout; in *A. bulbigera* it is marginate-bulbous as in some Cartinarii. Usually it is solid, and often peronate by a more or less persistent sheath when young, later scaly-spotted by the breaking up of this sheath. The VEIL is probably double in such species as *A. caligata* and *A. aurantia,* the outer veil being continuous with the cuticle of the pileus, the inner veil closely adherent to it between the margin of the pileus and the underside of the young gills. It is mostly membranous, but inclines to a cobwebby or fibrillose texture in *A. bulbigera* and when it sheathes the stem it breaks away from the margin of the pileus to form the spreading annulus. Sometimes it is lacerated at the junction of cap and stem and parts of it may remain on the margin of the pileus so that the pileus becomes appendiculate. In *A. mellea* the veil is extremely variable; it is usually membranous, but sometimes floccose-fibrillose or very thin and webby so that no annulus is formed on the stem. In other characters also *A. mellea* is quite variable. The SPORES are white, varying much in shape and size; in most species they are small and almost spherical; in some, as in *A. macrospora* Pk. from Colorado, they are elliptical and measure 10-15 x 6-8 micr. Several species have a distinct ODOR; that of *A. nardosmia* Ell. is said to resemble oil of almonds; that of *A. viscidipes* Pk. is strong and penetrating, somewhat alkaline. Nearly all the species are said to have a slight odor of some kind by which they can be distinguished. *A. mellea* Fr. is very common and plentiful in its season; the other species of Armillaria are infrequent and can be considered rare during any series of years. So far only five of the latter class have been found in the State, although doubtless our northern hemlock and pine forests hide others. It has seemed best, therefore, to include in the key such species as may occur within our

area. About 18 species of Armillaria have been mentioned in the literature as having been observed in the United States; only about half of these were reported east of the Mississippi River. Ricken, (Blätterpilze), refers all Armillarias to the genus Tricholoma. Some species of Clitocybe, Tricholoma, and Pleurotus will be looked for here.

Key to the Species

(A) Stem lateral or eccentric; pileus white. 694. *A. dryina* Fr. 695. (*A. corticata* Fr.)
(AA) Stem usually central.
(a) Pileus or stem viscid.
(b) Lignicolous, growing on tree-trunks, etc., pileus glutinous. *A. mucida* Fr.
(bb) Terrestrial.
(c) Only the stem viscid; pileus large, whitish, or yellow-tinged; odor penetrating, alkaline. *A. viscidipes* Pk.
(cc) Stem not viscid; pileus with a slightly viscid pellicle.
(d) Pileus and stem covered with tawny-orange to ochraceous-rufous scales. 691. *A. aurantia* Fr.
(dd) Pileus glabrous, pale-brick red; stem covered with pink-red floccose scales. 692. *A. focalis* Fr. var.
(aa) Pileus and stem not viscid.
(b) In caespitose clusters about stumps, trunks, etc., honey-yellow, becoming rusty-stained; gills adnate to subdecurrent. 693. *A. mellea* Fr.
(bb) Not caespitose; gills emarginate or rounded behind, not decurrent.
(c) Veil cortina-like, white, fugaceous; stem marginate-bulbous; pileus glabrous, gray, brownish or rufescent; spores 7-10 x 5 micr. *A. bulbigera* Fr.
(cc) Veil membranous; stem not marginate-bulbous.
(d) Pileus white or whitish.
(e) Stem sheathed by the subviscid, persistent veil; pileus large, 10-15 cm. broad, white or yellowish, glabrous. Spores globose, 4 micr. diameter. *A. magnivelaris* Pk. *A. ponderosa* Pk.
(ee) Stem not sheathed; veil fibrillose—membranous, not viscid; pileus 5-10 cm. broad, whitish to rusty-tinged; spores subelliptical, 7.5 x 5 micr. *A. appendiculata* Pk.
(dd) Pileus or scales dark brown, reddish-brown or grayish brown.
(e) Pileus glabrous, hard and compact; veil ample, gills broad; spores 7 micr., ovoid-globose. *A. robusta* Fr.
(ee) Pileus with brown or reddish-brown scales; gills narrow.
(f) Odor strong, of spikenard or oil of almonds; pileus whitish, except the brown scales; spores 6 micr., globose. *A. nardosmia* Ell. (See *A. caligata.*)
(ff) Odor none, scales reddish-brown to chestnut-brown; spores globose-ovate, nucleate, 6-7.5 x 5 micr. 690. *A. caligata* Fr.

A. TRICHOLOMATA. Gills sinuate-adnexed; stem fleshy, similar in substance to the pileus.

690. Armillaria caligata Vitt.-Bres.

Hymen. Europ., 1874.

Illustrations: Bresadola, Fungh. mang. e. vel., Pl. 17.
Gillet, Champignons de France, No. 33.
Barla, Champignons de Nice, Pl. 10, Fig. 4-7.
Patouillard, Tab. Analyt., No. 306.
Hard, Mushrooms, Fig. 42, p. 59 (as *A. nardosmia* Ell).
Van Hook, Ind. Acad. Sci. Proc., 1911, Fig. 1, p. 348 (as *A. nardosmia*).
Plate CXXXVII of this Report.

PILEUS 6-10 cm. broad, firm, convex then expanded and depressed, *spotted by appressed, rufous-brown or* dark brown, elongated *fibrillose scales,* elsewhere silky, white between scales or brunescent, margin at first incurved and margined by remnants of the veil. FLESH white, thick, compact. GILLS sinuate-adnate, at length with decurrent tooth, medium *broad* (5-8 mm.), heterophyllous, white, crowded, edge entire, trama of parallel hyphae. STEM *stout,* 4-7 cm. long, 2-3 cm. thick, subequal or tapering down, solid, sheathed at first to the middle or above it by *the veil* which *terminates above by an ample, flaring, thickish, membranous* ANNULUS, later breaking below into subconcentric, *rufous-brown* scales, white and rough-scurfy above the ring, then glabrous and shining, white within. SPORES spherical-ovoid to short elliptical, 6-7.5 x 5 micr., smooth, white in mass. BASIDIA 38-40 x 7-8 micr., 4-spored. ODOR none. TASTE of nuts or slightly bitterish-acrid.

Solitary or in caespitose pairs. On the ground, oak hillside bordering a tamarack bog. Ann Arbor. October. Rare.

Our plants agree so well with Bresadola's description and figure of *A. caligata* that I have no hesitancy in referring them there. There is a slight discrepancy as to odor. Bresadola describes the European plant with an agreeable, fruit-like odor. On this point our specimens also differ from the description of *A. nardosmia* Ell. Several correspondents from the eastern part of the United States inform me that their specimens of *A. nardosmia* often or always lack the odor of almonds attributed to it. Peck (Rep. 33) first referred the New York species to *A. rhagadisma* Fr., but in the

43d Report assigned it to *A. nardosmia*. I am inclined to think the New York species all belong to *A. caligata*. I have collected the same but smaller plant in New York, and it seems usually to be smaller farther south and east. Whether any microscopic characters accompany the almond odor remains to be seen. As in *A. aurantia*, the parallel hyphae of the gill-trama are an exception for this genus.

691. Armillaria aurantia Fr.

Syst. Myc., 1821. (As *Tricholoma aurantia*.)

Illustrations: Fries, Icones, Pl. 27.
Gillet, Champignons de France, No. 31 (too pale).
Bresadola, Fungh. mang. c. vel., Pl. 18.
Michael, Führer f. Pilzfreunde, Vol. III, No. 121.
Atkinson, Mushrooms, Fig. 86, p. 85, 1900.
Ricken, Blätterpilze, Pl. 87, Fig. 2. (As Tricholoma.)

PILEUS 5-7 cm. broad, convex then expanded, subumbonate, viscid in wet weather, *ochraceous-fulvous to tawny-orange-red,* with a pellicle which soon breaks up into numerous, crowded, appressed, concolorus scales, *margin at first inrolled and glutinous floccose.* FLESH white, thick, abruptly thin on margin. GILLS rounded behind, slightly adnexed, rather narrow, close, *white,* rusty-brown-spotted in age, a few forked, edge entire, trama of parallel hyphae. STEM 4-7 cm. long, 8-15 mm. thick, equal or narrowed downwards, *covered by concolorous subconcentric scales* up to the obscure annulus, white at apex and between scales, solid. SPORES minute, globose-oval, variable, 4-5 x 3-4 micr., smooth, nucleate, white. CYSTIDIA and sterile cells none. BASIDIA 25-28 x 4-5 micr., 4-spored. ODOR strongly farinaceous, somewhat disagreeable.

Scattered. On sandy ground under hemlock trees. New Richmond. September. Infrequent.

This is *Tricholoma peckii* Howe. The quite young plant has an ovate obtuse pileus with an inrolled margin, and an external, colored layer which breaks up into appressed floccose patches or scales, but scarcely ever leaves an annulus. That it is a better Tricholoma, where Fries at first placed it, is shown by the structure of the gill-trama whose hyphae lie in a parallel position. The tawny-orange red color of the scales is a distinguishing character. Cooke's figure (Ill., Pl. 33) evidently illustrates a different species. Bresadola

says it has the odor of stale olives, while Maire (Soc. Myc. France, Bull. 27, p. 404) reports a slight dextrine odor.

692. Armillaria focalis Fr. var.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 245.

PILEUS 3-6 cm. broad, campanulate-convex, *soft-fleshy,* obtuse, even, *glabrous,* provided with a thin, separable, *viscid* cuticle, *bright brick-red.* FLESH thin, tinged pink. GILLS *sinuate-adnexed,* rather broad, about 5 mm., ventricose, soft, close, white or tinged brick-red, edge thin. STEM 4-11 cm. long, 5-8 mm. thick, rather slender, subequal, attenuated below, soft, solid, fragile, *covered by brick-red, floccose scales up to the evanescent, median annulus,* whitish and silky-shining above. SPORES globose, 3-4.5 micr., white, smooth; basidia 4-spored, slender, about 24 micr. long. CELLS of the gill-trama large, 75-125 micr. long, about 12 micr. wide, *divergent.* Cells of the cuticle of pileus long, narrow, 5-6 micr. wide, gelatinous. ODOR and TASTE farinaceous.

Gregarious or solitary, on the ground, in mixed hemlock and maple woods, clay ravines. New Richmond. September. Rare.

This plant seems to be intermediate between *A. focalis* and *A. aurantia.* Its pileus is somewhat viscid and in this respect differs from *A. focalis* and is related to *A. aurantia.* Its spores also approach those of *A. aurantia.* In stature, texture of the flesh, character of pileus, etc., it is, however, quite different from *A. aurantia.* The soft texture is given as an important character of *A. focalis,* and Cooke's illustration gives a good idea of the coloring and the appearance of the stem of our plants, except that the stem is much more elongated and attenuated downward. No critical studies of *A. focalis* Fr. could be found, and it is possible that its cap may be provided with a viscid pellicle in wet weather.

B. CLITOCYBAE. Gills attenuated behind, more or less decurrent; stem solid.

693. Armillaria mellea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 32.
Atkinson, Mushrooms, 1900, Pl. 27, p. 84.
Hard, Mushrooms, 1908, Figs. 39, 40, p. 56, 57.
Marshall, Mushroom Book, p. 61.
Murrill, Mycologia, Vol. 1, Pl. 1, Fig. 2.
Conn. Nat. Hist. Survey, Bull. No. 3, Pl. IV.
Plates CXXXVIII, CXXXIX, CXL of this Report.

PILEUS 3-10 cm. and more broad, oval to subhemispherical at first, then convex to almost plane, obtuse, normally honey-colored, varying to yellowish-brown, rusty-brown, or quite pale, adorned with dark-brown or blackish pointed tufts or scales, sometimes glabrescent, striate on margin in age. FLESH whitish. GILLS *adnate* or decurrent, subdistant, whitish or dingy yellowish, becoming rusty-stained in age, not broad, at length powdered by the white spores. STEM variable in length, 5-15 cm. long, 6-20 mm. thick, *equal,* stuffed then hollow, often spongy within, fibrous without, elastic, floccose-scaly, glabrescent, glabrous or striate and mealy at apex, whitish above, dingy yellowish, brownish or rusty-stained below. The VEIL is usually well-developed, membranous, and at first conceals the gills, at length collapsing to form a superior *annulus;* sometimes both veil and annulus are almost or entirely lacking; they are white or whitish, sometimes stained like cap and stem. SPORES elliptical-ovate, 8-9.5 x 5-6.5 micr., white, smooth, nucleate; basidia 4-spored; trama of gills composed of divergent hyphae. TASTE somewhat disagreeable or acrid.

Caespitose. At base of living tree-trunks, around stumps, decaying roots, etc., of all sorts of trees, both conifer and broad-leaved. Throughout the State. July-November (earliest record July 13, latest November 2). Very common. Parasitic and saprophytic.

In an abundant species like this, the variations are much more easily observed than in a rare plant, so that about ten varieties have been named and described. The most important of these is var. *exannulata* Pk. This is an ecological form, doubtless, whose dense, caespitose clusters, stem attenuated below, undeveloped an-

nulus and small glabrous pilei, are the result of unfavorable conditions. Other varieties, like *obscura, flava, glabra, radicata, bulbosa,* etc., differ from the normal condition in the characters indicated by their respective names. An abortive form occurs, doubtless parasitized like *Clitopilus abortivus,* by some other fungus whose identity is unknown. This form consists of irregular roundish white masses composed of fungus mycelium. For a fuller account see N. Y. State Mus. Rep. 48, page 262.

Armillaria mellea is of considerable economic importance. At times it grows from living roots to which it is connected by black, twine-like strands called Rhizomorphs. These are often found even where no fruit-bodies are present, and before their connection with this species was known, the strands were referred to an independent fungus and called *Rhizomorpha subcorticalis.* These strands extend under the bark of living roots and eventually injure or kill the trees. The American *A. mellea* is safely edible. Large quantities are collected by the foreign-born population of some localities—Detroit and the mining regions of the Northern Peninsula; they are dried, and used for the table during the winter. The taste is somewhat disagreeable, and many people do not think them particularly palatable.

Clitocybe monodelpha Morg. has been considered by some as a variety of this species. It is, however, clearly separated by the character of the hyphae in the gills, which do not diverge as in the genus Armillaria, but lie parallel between the subhymenial layers.

C. PLEUROTOIDAE. Stem eccentric or lateral; gills decurrent.

694. Armillaria dryina Fr.-Pat.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 226. (As Pleurotus.)
Patouillard, Tab. Analyt., No. 517.
Atkinson, Mushrooms, Pl. 32, Fig. 106, 1900. (As Pleurotus.)

PILEUS 4-8 cm. broad, firm, convex-plane, *floccose-tomentose at first,* in dry situations *becoming scaly* from the breaking up of the floccose covering, *white,* scales darker in age, margin at first involute. GILLS decurrent, subdistant, attenuated at ends, broadish in the middle, white, not anastomosing behind. STEM eccentric or lateral, 2-4 cm. long, 1-1.5 cm. thick, subequal, sometimes stouter

at first, covered by a more or less dense tomentum, especially toward base, above with a somewhat temporary *annulus* from the thin, membranous veil, which is quickly lacerated and disappears as pileus expands. SPORES oblong, 9-10 x 4-4.5 micr., smooth, white. ODOR very strongly of oil of bitter almonds (benzaldehyde).

From base of stumps, on trunks, etc. Marquette. August. Infrequent.

The plants described above were growing near the ground and in a moist situation and this may account for the unusual tomentosity on the stem. The size of the spores, which appeared to be mature, would seem to be one basis of separation from the next species. When the stem is lateral or nearly so, the pileus is usually subreniform.

695. Armillaria corticata Fr.-Pat.

Syst. Myc., 1821.

Illustration: Atkinson, Mushrooms, Pl. 33, Fig. 107. (Small forms as Pleurotus.)

PILEUS 6-15 cm. or more broad, convex-expanded, obtuse or depressed, *firm, dull white or becoming brownish* tinged, finely floccose at first, then the *cuticle breaks up into scale-like areas,* margin at first involute and appendiculate. FLESH thick, white. GILLS decurrent, moderately close, *rather broad,* narrowed behind, white becoming yellowish, *anastomosing on the stem,* edge entire. STEM 4-10 cm. long, eccentric or almost lateral, sometimes stout and short, solid, firm to rigid, subtomentose or floccose, reticulate in large specimens, equal or tapering down. VEIL attached near apex, leaving a thin, white flocçose-membranous evanescent ring, or sometimes remnants on the margin of the pileus. SPORES *cylindrical-elongated, large,* 13-17 x 4-5 micr., smooth, white. BASIDIA 4-spored. ODOR slightly acid-aromatic to foetid.

Solitary or caespitose, on wood, especially on living trunks of hickory, maple, etc. Ann Arbor, Marquette. September-November. Infrequent.

This is considered by Atkinson (Mushrooms, p. 106, 1900) as merely a form of *A. dryina,* and as far as the variation of stem-length and size of plant are concerned, such a conclusion is well supported. The difference in the size of the spores in our collections has, however, opened up the question again, and further study

seems necessary. Schroeter gives 13-15 x 4-5 micr. as the size of the spores of *A. corticata,* a measurement nearly equal to the spore length of our form. The size of the spores of *A. dryina* is not mentioned by most authors; Massee says they are 10 x 4 micr. Large specimens of this species when the veil has disappeared, might be mistaken for *Pleurotus ulmarius* or *Panus strigosus;* but *P. ulmarius* has sinuate-adnexed gills and *P. strigosus* has a nap of strigose-villose hairs on cap and stem and is much larger.

Pleurotus Fr.

(From the Greek, *pleuron,* a side, and *ous,* an ear.)

White-spored, (except *P. sapidus* and *P. subpalmatus*). Stem fleshy, *eccentric, lateral or lacking,* continuous with the pileus. Gills adnate, adnexed or decurrent. Veil *none.*

Putrescent, (except *P. atrocaeruleus P. atropellitus, P. niger,* and *P. striatulus*), *lignicolous,* medium to large, or often small and then resupinate. Intergrading with the genera Clitocybe and Armillaria. They correspond to the genera Claudopus and Crepidotus of the pink-spored and ochre-brown-spored groups respectively. All are believed to be *edible,* and are considered by many people the most delicious of our mushrooms when properly prepared.

The PILEUS varies from quite large in those attached laterally or with a stem, to quite small when it is resupinate. *P. ulmarius* and *P. ostreatus* and their near relatives have a thick, fleshy pileus and ample gills, thus providing a large amount of food for the mushroom enthusiast. The small species are rather thin, often membranous; four of the species revive on moistening. Our large species are nearly all white when fresh, becoming tan-colored or darker when old, and are always firm and even tough in age. The medium-sized species are ashy, greenish, yellowish or reddish in color. The small forms are white, gray or blackish. Several are hygrophanous. Several have a gelatinous or viscid upper layer, of which the thick-fleshed *P. serotinus* is the most note-worthy. The GILLS are fastened to the stem, but their mode of attachment is so different in the various species as to have given some authors ground for making distinct genera out of the sections. In some they are deeply decurrent as in Clitocybe, in others, sinuate-adnexed as in Tricoloma, and in the resupinate and lateral species they radiate from the point of attachment of the pileus as in Crepidotus of the ochre-brown-spored group. In the large species

they are usually very broad. Among the medium-sized forms there are cases where the gills are very narrow and very crowded, reaching the base almost as lines; examples of this class are *P. petaloides, P. borealis,* and *P. porrigens.* The small, resupinate forms expose the gills on the upper side while the pileus is closely applied to the substratum; later the pileus becomes reflexed so that the gills project downward, giving the older a different appearance than the younger plant. This genus is often separated from Clitocybe with difficulty, especially in the cases where the stems are only slightly eccentric, so that different authors have placed the same plant under the two genera. The STEM is occasionally almost central in the large-stemmed species, which may then be mistaken for Tricholomas; the latter, however, grow practically always on the ground. Otherwise, the stem is lateral, eccentric or entirely wanting. The interior of the stem is fleshy-fibrous in most species, but several have a stuffed to hollow axis, with a tough exterior, as in *P. lignatilis.*

The SPORES are white except in the aberrant species *P. sapidus, P. euosmus* and *P. subpalmatus* in which the spores have a slight flesh color or lilac tint. *P. sapidus* and *P. euosmus* resemble *P. ostreatus* so closely in other respects, that placing them among the pink-spored agarics would not improve matters. *P. subpalmatus* seems to me nearer Entoloma as its stem is sometimes central; its reticulate, toughish, gelatinous pileus is rather unique, and reminds one of the genus Heliomyces. The spores of the Pleuroti are smooth, mostly spherical and then minute, or oblong; in a few species, elliptical. CYSTIDIA are known to be present in *P. scrotinus, P. stratosus, P. petaloides* and *P. mastrucatus. P. ostreatus* is said to produce scattered conidia on top of its pileus, which represent another kind of spore. The ODOR is often fragrant and agreeable, and the flavor of most of the species makes them very desirable for the table.

The genus may be divided into three sections:

Section I. Eccentrici.

Section II. Dimidiati.

Section III. Resupinati.

The subdivision which was used by Fries and others for those forms with an inner veil is omitted here, since our two species *P. corticatus* and *P. dryinus* have been transferred to the genus Armillaria, where it seems to me they more properly belong, and for which they have often been mistaken. A few species not yet found in the State have been included in the key.

Key to the Species

(A) Stem eccentric; pileus entire or at least marginate behind; plants of medium size to very large.
(a) Pileus brown or blackish brown, umbonate, 2-7 cm.; gills subdistant, broad; spores 5-6 x 4-5 micr. *P. umbonatus* Pk.
(aa) Pileus yellow, yellowish or reddish. [See also (aaa).]
(b) Pileus glabrous, gelatinous on top, coarsely-reticulate, pinkish or flesh color; spores globose, echinulate. 699. *P. subpalmatus* Fr.
(bb) Pileus strigose hairy, scaly or fibrillose.
(c) Very large; pileus lateral, cream-color then yellowish, strigose hairy; gills very broad; stem short. (See 12a. *Panus strigosus* B. & C.)
(cc) Medium-size; stem medium long and not very eccentric.
(d) Pileus and stem densely dotted with brown or blackish scales; spores globose, minute. (See 760. *Clitocybe decora* Fr.)
(dd) Pileus unicolorous, silky-fibrillose, umbonate; spores elliptical, 7-9 x 5-6 micr. 698. *P. sulfuroides* Pk.
(aaa) Pileus white when young or fresh.
(b) Plant large, on standing elms, etc., stem rather long and stout; gills emarginate or sinuate, rounded behind, broad. 696. *P. ulmarius* Fr. 697. *P. elongatipes* Pk.
(bb) Gills adnate, adnate-decurrent or long-decurrent.
(c) Spore print pale dingy lilac; pileus thinner and more flaccid than *P. ostreatus*. 702. *P. sapidus* Fr.
(cc) Spore print white.
(d) Stem stout, usually quite short.
(e) Gills running down the stem in lines and anastomosing; plant rather stout. 700. *P. ostreatus* Fr.
(ee) Gills not anastomosing on stem, but strongly decurrent. Spores longer than in the preceding two, 12-15 x 5 micr. 701. *P. subareolatus* Pk.
(dd) Stem slender, 2-5 mm. thick; gills narrow and crowded.
(e) Pileus hygrophanous, hyaline-white, thin; stem solid, pruinose-floccose. 705. *P. fimbriatus* var. *regularis* var. nov.
(ee) Pileus not hygrophanous, tough, medium size to small.
(f) Dingy-white; pileus irregular; stem curved, subvillose, odor farinaceous-oily. 703. *P. lignatilis* Fr.
(ff) Entirely white; pileus regular, orbicular; stem straight, glabrous; odor faint. 704. *P. circinatus* Fr.

(AA) Stem none or very short; pileus sessile or continuous with the stem.
(a) Pileus at first resupinate.
(b) Upper layer of pileus gelatinous, forming a pellicle.
(c) Pileus 2-5 cm. broad, more or less reniform to obovate.
(d) Pileus gray or blackish-brown, margin paler, villose, gills not very broad, whitish. 714. *P. atrocaeruleus* Fr. var. *griseus* Pk.
(dd) Pileus rich brown, covered with squarrose or erect scales; gills broad, grayish-white. 713. *P. mastrucatus* Fr.
(cc) Pileus minute, in the shape of a pendulous, reversed vase or cup, pale gray; on herbaceous stems. *P. cyphellaeformis* Berk.
(bb) Pileus without a gelatinous pellicle.
(c) Pileus pure white, rarely varying to pale tan.
(d) Pileus 3-7 cm. long, flabelliform, obovate or cuneate; gills narrow, crowded, forked.
(e) Pileus tomentose; spores spherical; gills scarcely forked. 713. *P. albolanatus* Pk.
(ee) Pileus glabrous, margin involute; spores longer than broad; gills forked. 710. *P. porrigens* Fr.

(dd) Pileus minute, 3-10 mm. broad, plane; gills rather broad, subdistant. 711. *P. septicus* Fr.
(cc) Pileus gray to blackish, minute.
(d) Pileus glabrous, striate; gills few, distant. *P. striatulus* Fr.
(dd) Pileus not glabrous.
(e) Spores elliptical; pileus 7-16 mm. broad; gills close, blackish. 716. *P. atropellitus* Pk.
(ee) Spores globose; gills broad, thick.
(f) Pileus dark cinereous, subpruinate, margin striatulate. 715. *P. applicatus* Fr.
(ff) Pileus black, plicate on margin, pulveraceous; gills close. *P. niger* Schw.
(aa) Pileus never resupinate, sessile nor attached by a short lateral stem, but pileus not marginate behind.
(b) Upper layer of pileus gelatinous or viscid.
(c) Pileus smoky yellowish green, dimidiate; flesh thick; spores oblong, 4.5 x 1.5 micr. 706. *P. serotinus* Fr. (Syn. *P. serotinoides* Pk.)
(cc) Pileus whitish or tinged alutaceous coreaceous-fleshy, cuneate, spathulate or fan-shaped, spores minute, globose; cystidia abundant. (See 16. *Panus angustatus* Berk.)
(bb) Without a gelatinous surface layer.
(c) Pileus hygrophanous, grayish-brown; gills rather distant, narrow, stem lateral. *P. tremulus* Fr.
(cc) Pileus not hygrophanous.
(d) Pileus sessile, pure white, small, flattened, radiately rugose; gills subdistant, broad. 709. *P. candidissimus* B. & C.
(dd) Pileus not pure white, 1-2 cm. broad, cuneate, or spathulate.
(e) Spores elliptical, 7.5 x 4-5 micr. 708. *P. spathulatus* Fr.
(ee) Spores globose, 3-4 micr. diam. 707. *P. petaloides* Fr.

(Morgan, Cinn. Soc. Nat. History, Vol. 6, p. 78) reports *P. craspedius* Fr. a rather large, brown, stipitate species, margin of pileus crenate or lobed, gills close, narrow and white, spores globose, 5-6 micr.)

Section I. Eccentrici. Pileus entire or at least marginate behind; stem eccentric.

**Gills sinuate emarginate, or obtusely adnate.*

696. Pleurotus ulmarius Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 102-3, p. 102, 1900.
Hard, Mushrooms, Fig. 119, p. 156, 1908.
Clements, Minnesota Mushrooms, Fig. 19, p. 32, 1910.
Chicago Nat. Hist. Surv. Bull. VII, Part I, Plate V, 1909.
N. Y. State Mus. Rep. 48, Plate 26, Fig. 1-4, 1906, Bot. ed.
Freeman, Minnesota Plant Diseases, Frontispiece, 1905.
Plate CXLI of this Report.

PILEUS 5-15 cm. or more broad, compact, firm, convex then expanded, obtuse, moist, *glabrous* or somewhat tomentose, *white or whitish,* becoming dull leather color in age, sometimes with yellowish or brownish shades, even on margin but often cracked in age. FLESH white, thick. GILLS *sinuate-adnexed* becoming emarginate or rounded behind, broad, close to subdistant, *white or whitish.* STEM 3-7 cm. long, variable, 1-2 cm. thick, *stout, solid,* firm, eccentric, straight or curved, glabrous, sometimes slightly or densely tomentose, whitish. SPORES spherical, 5-7 micr. diam., smooth, *white in mass.* ODOR and TASTE pleasant.

(Dried: Brownish-tan throughout.)

Solitary or caespitose. On decayed or living wood of elm, hickory, maple trunks, etc.; often from a crack or wound of the living tree. Throughout the State. September-November. Rather infrequent except locally.

This Pleurotus apparently occurs only on frondose trees, especially on the elm—whence its name. It is not known whether it is parasitic on the living trees or not. Shade-trees in cities are frequently its home. It is one of our best edible mushrooms when young, but in age it becomes somewhat leathery. Once located on a tree, it may often be found fruiting in successive seasons. It often appears on the pruned ends of branches, and may be found far up on the tree. This species is largely free from grubs, especially in the late fall, and often persists or dries in place. It forms a good article of diet in winter, if it is collected when young and the caps are dried. Some of its characters are quite variable. It may appear in dense clusters, or only as a single individual. When growing from the side of a trunk, the stems often grow downward and the cap develops horizontally. Others grow erect, especially when they appear on top of the branch. When the plant grows to considerable size, it is usually quite tomentose on the pileus and stem, which normally are glabrous. The color is often quite deceptive. Early, fast-growing individuals are pure white, but late, slow growing ones become brownish or tan-colored; all of them tend to become darker in age. The stems are mostly eccentric, but erect plants may have central stems. The mode of attachment of the gills is the most important distinction between this species and *P. ostreatus* and *P. sapidus;* for although the latter have short and lateral stems, *P. ulmarius* also may have stunted stems growing far to one side. As all of them are equally edible, this point is only of diagnostic importance. Several varieties have been described, based on the variations mentioned above.

697. Pleurotus elongatipes Pk. (Edible)

Jour. of Mycology, Vol. 14, 1908.

PILEUS 5-10 cm. broad, convex or nearly plane, glabrous, white, even on the margin. FLESH *rather thin,* white. GILLS *adnexed then emarginate,* rounded behind, close, moderately broad, thin, white. STEM very long, 5-15 cm., 6-10 mm. thick, *stuffed then hollow,* variously curved or flexuous, usually eccentric, glabrous above, more or less tomentose toward base, white. SPORES minute, sphoeroid, 4-5 micr. in diam., smooth.

(Dried: Pileus and gills ochraceous-tan, stem dingy buff.)

Subcaespitose or solitary. On prostrate trunks or decaying logs. Whitmore Lake, Washtenaw County and Stevens Lake, Wayne County. October. Rare?

This species seems most closely related to *P. ulmarius,* and is no doubt often confused with it. Peck, who described it from the Wayne County specimens sent him by Dr. O. E. Fischer, considers it most closely related to *P. lignatilis.* It differs from *P. lignatilis* in its much stouter habit, and adnexed-emarginate gills. From *P. ulmarius* it seems separable by its stuffed to hollow stem. All of the cotype specimens in my possession have a rather large hollow stem when dried. Those in another collection have the habit and appearance of *P. ulmarius,* but with the characteristic hollow stem in the dried condition. Dr. Peck's acuteness has thus, I believe, found that our common *Pleurotus ulmarius* is composed, at least in this region, of two distinct species. It is no doubt edible and the separation is only of scientific interest. The stems of the type specimens were very long, but it is likely that those were plants of an extreme form.

698. Pleurotus sulfuroides Pk.

N. Y. State Mus. Rep. 23, 1872.

Illustration: Atkinson, Mushrooms, Fig. 108, p. 107.

PILEUS 2-7 cm. broad, convex, *umbonate,* subexpanded, silky-fibrillose or minutely scaly, glabrescent, pale yellow, variegated when moist. FLESH thin, soft. GILLS slightly decurrent at first, *soon emarginate* and rounded behind, close, rather broad, *sulfur-yellow to yellowish,* white-floccose on edge when young.

STEM 3-8 cm. long, 5-7 mm. thick, *eccentric,* rigid-elastic, variously curved, equal, fibrillose, *pale yellow, stuffed then hollow,* apex floccose, even. SPORES oval to short elliptical, 6-9 x 5-6 micr., granular within, smooth, white. CYSTIDIA none.

(Dried: Bay-brown throughout.)

Gregarious or subcaespitose. On decaying logs, hemlock or mixed woods. Bay View, New Richmond. September. Rare.

This species is usually rather long-stemmed, but it also occurs with a short, firm stem. Sometimes it is rather soft in texture but in dry weather it becomes firm. It is easily distinguished by the pale yellow color of the whole plant. In one collection the color was more truly sulfur-yellow. When it is dried, it assumes a bay-brown or dingy chestnut color.

699. Pleurotus subpalmatus Fr.

Epicrisis, 1836-38.

Illustrations: Lloyd, Mycological Notes, Vol. I, Fig. 23, p. 51. Cooke, Ill., Pl. 255. (This has not the appearance of our plant.)

PILEUS 3-5 cm. broad, fleshy, convex-plane, obtuse, *the cuticle gelatinous, coarsely reticulated* and separable, *brick-red to flesh color,* glabrous. FLESH rufescent, thick except at margin. GILLS *adnate,* moderately broad, subventricose, close, thin, a few forked at times or interspaces venose, *becoming salmon color.* STEM coriaceous-fleshy, confluent with pileus, 2-3 cm. long, 5-6 mm. thick, equal, *somewhat eccentric,* curved, fibrillose, fibrous-stuffed, reddish within and without. SPORES globose, *echinulate,* whitish, *flesh color in mass.*

On prostrate maple trunk, cut timber, etc. Houghton, Detroit (Grosse Isle). August-September. Rare.

This rare species has been collected in this country in a small number of widely separated localities. Morgan and Lloyd both report it from Ohio. It seems to have been collected in Kansas and Minnesota. We have it from the northern and southern sections of our State. It departs so widely from the genus Pleurotus in its echinulate spores, which are flesh-colored, and the peculiar raised net-work of reticulations on the upper surface of the pileus, that it might be considered well marked as an independent genus. It is just as properly an Entoloma as a Pleurotus; and why not a

Heliomyces? Its flesh becomes tough at maturity, at least in dry weather. Lloyd's figure is an excellent illustration of the plant as I found it at Houghton.

***Gills adnate-decurrent or deeply decurrent, narrowed to a point or line on the stem.*

700. Pleurotus ostreatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Pl. 30, Fig. 104, 1900.
Hard, Mushrooms, Pl. 18, Fig. 117, 1908.
McIlvaine, Amer. Mushrooms, Plates 35 and 35a, 1900.
Marshall, Mushroom Book, Pl. 9, 58, 1905.
Michael, Führer f. Pilzfreunde, Vol. II, No. 79 (dark form).
Plate CXLII of this Report.

PILEUS 5-20 cm. or more broad, firm, ascending or shelving, *conchate*, subdimidiate to elongated, convex or depressed, white or whitish becoming darker or brownish-ashy, moist, glabrous, margin thin and even, sometimes subrimose. FLESH thick, somewhat soft. GILLS, close to subdistant, *decurrent and running down the stem in raised lines which anastomose*, broad in the middle, narrowed at ends, white or whitish. STEM *lateral, short or almost lacking*, stout, solid, firm, often tomentose or strigose-hairy at base, whitish. SPORES oblong, 7-10 x 4 micr., smooth, *white in mass*. ODOR and TASTE agreeable.

Caespitosely imbricated, often in large shelving clusters on standing dead trunks of poplar, maple, elm, birch, willow, etc.; rarely on hemlock or pine; often on sawed logs scarcely decayed. Throughout the State. May to November. Common.

Distinguished from *P. sapidus* and *P. ulmarius* by the peculiar cross-connections of the decurrent gills on the stem. It has usually stouter and thicker pilei than *P. sapidus* and has white spores. *P. ostreatus* is apparently more common in southern Michigan, while *P. sapidus* is the usual form in the north, although both are found in the same region. It varies in color from dirty-white to smoky-white, becoming brownish-tan in age like the two related species. In luxuriant specimens the gills are very broad, but taper at the ends. It is called the "Oyster Mushroom" because of its conchate pileus. Authors differ as to whether it is of first or

second quality for the table—the difference in quality is probably due to the manner of cooking. Dr. Cooke says it may be spoiled by improper preparation. Hard says they must be carefully and thoroughly cooked, and this is an important fact. My own preference is the method used in frying oysters, only it is better to cut the cap *into small pieces* since they do not cook as quickly as an oyster. The caps should be collected within a few days of their appearance, as they become infested with small beetles; these, however, usually hide only between the gills, and can be shaken out, leaving the plants still fit to eat. At the first signs of decay they are no longer desirable.

701. Pleurotus subareolatus Pk. var.

N. Y. State Mus. Rep. 30, 1878.

PILEUS 3-8 cm. broad, almost as long, firm, convex, spatulate, *cuneate or flabelliform,* lateral but marginate behind, *white then dingy,* tomentose behind, silky tomentose in front, obscurely areolate, margin at first involute. FLESH thick, surpassing width of gills, rather soft. GILLS decurrent, scarcely or not at all anastomosing on stem, *rather broad,* attenuate at ends, *subdistant,* white, at length brownish, edge entire. STEM short, almost lateral, ascending, 2-3 cm. long, about 1 cm. thick, firm, solid, sometimes spongy within, equal, even, white then dingy or subrufescent, tomentose. SPORES *long, subcylindrical,* 12-15 x 4-5 micr., smooth, white. CYSTIDIA none. BASIDIA about 45 x 7 micr., attenuated downward, 4-spored. ODOR and TASTE mild or slightly nauseous.

Solitary or few in cluster. On living trunks of maple, basswood, etc. Ann Arbor, New Richmond. September-October. Infrequent.

This species is referred here with some hesitancy. Peck described his plants from a single collection, and emphasizes the areolate character of the surface of the cap. He does not give the shape of the pileus, but the stem is said to be eccentric, so that the pileus was probably much more regular than in our plants. The spores, gills and most of the other essential characters agree. It is probable that if we had accounts of the spore-size of some of the European species, our plant could be easily placed. The margin remains involute a long time, and Peck, in a note (Rep. 54, p. 164) states that his species had a small, white membranous veil in the young condition, showing its relation to Armillaria. No such veil was observed in my plants.

702. Pleurotus sapidus Kalch. (Edible)

Hymen. Hungariae, 1873.

Illustrations: Atkinson, Mushrooms, Plate 31, Fig. 105, 1900.
Hard, Mushrooms, Pl. 20, Fig. 123, 1908.
N. Y. State Mus. Rep. 48, Pl. 27, 1896, Bot. ed.
Cooke, Ill., Pl. 954.

PILEUS 5-10 cm. or more broad, firm, ascending or shelving, subdimidiate or elongated, convex to subexpanded, depressed behind, *glabrous,* often irregular and with wavy margin, white or whitish, often tinged tan, yellowish, gray or brownish, margin thin and even. FLESH white, moderately thick. GILLS close to subdistant, decurrent, *rarely anastomosing,* broad, white or whitish. STEM short or almost lacking, strongly eccentric or lateral, solid, firm, glabrous or slightly tomentose at base. SPORES narrowly oblong, 7-11 x 3-4.5 micr., smooth, *tinged lilac in mass* on white paper. ODOR and TASTE agreeable.

Caespitosely imbricated, habit variable, as in *P. ostreatus.* On dead tree-trunks and firm logs, of maple, elm, beech, oak, birch, willow, etc. Throughout the State. May to November. Very common.

Like *P. ostreatus* in general appearance and in practically all of its characters except the lilac tinged spores. The gills anastomose only at times, and the flesh is on an average thinner in Michigan plants. Our plant is mostly shelving and lateral-stemmed as shown in Atkinson's figure. Only occasionally does one find suberect, eccentric or almost central-stemmed plants like those figured by Peck and Cooke. The lilac tinge of the spores is aberrant within the white-spored group, and yet the plant is so close to *P. ostreatus* in other respects that it would be a stranger in the pink-spored group; this species illustrates again that no grouping can be made perfect. Its edible qualities are just like those of the oyster mushroom, and the remarks made under that species apply equally here. Both of these species are much sought in Europe, and the peasants there often water the trunks of the trees where they occur, and in this way obtain a new crop of the mushrooms. Both are apt to appear, after the spring or autumn rains, in the same logs and trunks, so that one may visit the same place year after year and obtain a supply.

703. Pleurotus lignatilis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 257.
Hard, Mushrooms, Fig. 126, p. 163 (as *P. abscondens*).
Gillet, Champignons de France, No. 538.
Plate CXLIII of this Report.

PILEUS 2-5 cm. broad, tough, *irregular,* convex, sometimes depressed or umbilicate, flocculose-pruinose, then glabrous, *whitish.* GILLS adnato-decurrent, *crowded, narrow,* white. STEM 2-4 cm. long, 2-4 mm. thick, slender, *stuffed then hollow,* equal, irregular-curved, eccentric, somewhat villose. SPORES minute, oval, 3-5 x 2-3 micr., smooth, white. ODOR markedly *farinaceous.*

Gregarious on logs, etc. Bay View. August-September. Infrequent.

Var. *abscondens* Pk. has gills truly adnate becoming emarginate; spores elliptical, 4-5 micr. long.

The plants referred here agree with the figures of European authors in having the gills acuminate-adnate on the stem, so that as the pileus expands they appear subdecurrent. This is also true of the following two species. On account of this characteristic, it seems to me these three species had better be grouped under our second section than with *P. ulmarius*, where Fries and all others have placed them. *P. lignatilis* and *P. circinatus* and *P. fimbriatus* var. are very much alike in general appearance. To distinguish the species one has to rely on the farinaceous odor of *P. lignatilis,* on the subsolid stem and peculiarly hygrophanous pileus of *P. fimbriatus* var., and on the very regular cap of *P. circinatus.* The spores in all three are minute and somewhat alike. The pileus of *P. lignatilis* often tends to be subinfundibuliform.

704. Pleurotus circinatus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Plate 88.
Cooke, Ill., Pl. 257.

PILEUS 2-5 cm. broad, or less, *regular, tough,* convex, then plane and slightly depressed, *white or whitish, silky pruinate.* FLESH

thickish, white. GILLS adnato-decurrent, *crowded, narrow,* white. STEM 2-5 cm. long, *stuffed then hollow,* equal, eccentric, slightly curved or straight, *glabrous,* mycelioid at base. SPORES minute, elliptical, 4-5 x 2-3 micr., smooth, white. ODOR slight, *not farinaceous.*

(Dried: Gills yellowish-ochraceous; pileus and stem ochraceous-tan.)

Gregarious. On logs in hemlock woods of northern Michigan; frondose woods in the south. Bay View, Detroit (Grosse Isle). August-September. Infrequent.

The plant is white at first but becomes dingy-tan when old. It is toughish and the flesh is rather thick as in *P. lignatilis.* Both lack the thin, hygrophanous appearance of the next species. The stem is usually longer than the width of the pileus. It lacks the distinct farinaceous odor of *P. lignatilis.*

705. Pleurotus fimbriatus Fr. var. regularis var. nov.

Sys. Myc., 1821. (As *Clitocybe fimbriatus.*)

Illustration: Plate CXLIV of this Report.

PILEUS 2-5 cm. broad, broadly convex, then plane, obtuse, depressed or subinfundibuliform, *pseudohygrophanous, hyaline-white,* then opaque-pruinose, wavy, irregularly lobed or almost regular, glabrous, even on margin. FLESH thin, slightly tough, white. GILLS acuminately adnato-decurrent, *narrow, crowded,* thin, whitish becoming yellowish in age. STEM 1-3 cm. long, 2-5 mm. thick, slender, curved, toughish, equal, *solid* except a narrow tubule, floccose at apex, pruinose or silky fibrillose, pallid. SPORES minute, ovate, 4 x 3 micr., smooth, white. CYSTIDIA none; sterile cells on edge of gills, slender. ODOR somewhat *farinaceous* to oily. TASTE slightly bitterish-astringent.

On hemlock, elm, etc., logs in woods. Bay View, Ann Arbor. June-September. Infrequent.

The pileus when moist has the appearance of a delicate, translucent, immature egg-shell; its margin is sometimes concentrically rivulose. The stem is at first firmly stuffed then tubular. For comparisons see notes on the preceding two species.

Section II. Dimidiati. Pileus lateral, not marginate behind, not at first resupinate, sessile or continuous with the stem-like base.

706. Pleurotus serotinus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 24, p. 161, 1908 (as *P. serotinoides* Pk.).
Cooke, Ill., Pl. 258. (Without the olive tints, etc.)
Patouillard, Tab. Analyt., No. 629.

PILEUS 3-8 cm. broad, campact, convex or nearly plane, lateral, orbicular, dimidiate or reniform, *with a gelatinous pellicle* which becomes viscid when moist, *olivaceous-umber* but varying to yellowish greenish or brown, surface often covered with a short, dense tomentum. FLESH white, thick, firm. GILLS abruptly subdecurrent, thin, broad, narrow in front, close, whitish or tinged ochraceous or tan. STEM *very short*, lateral, continued above with the pileus, stout, 5-20 mm. long, 8-10 mm. thick, *yellowish beneath,* subtomentose or dotted with brown or blackish scales, solid. SPORES minute, linear-oblong, slightly curved, 4-6 x 1-1.5 micr., smooth, white in mass. CYSTIDIA fusiform, yellowish, about 25 micr. long. BASIDIA 4-spored. ODOR and TASTE none.

(Dried: Colors similar to those of fresh condition.)

Caespitose, imbricated, often laterally connate, sometimes solitary. On fallen elm trunks, or dead branches of various frondose trees. Southern Michigan; probably throughout the State. August-November. Frequent locally.

The mode of growth is similar to that of *Claudopus nidulans,* but lacks the odor of the latter and is usually more compact and the colors are dingy. The spores usually found deposited on the lower pilei from those above are white. The tomentum on the pileus often breaks up into punctate scales. The short stem, seen only below, has a yellow-tomentose covering. It may appear in considerable quantity on a single tree trunk.

707. Pleurotus petaloides Fr.

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 109-10, p. 108, 1900. Cooke, Ill., Pl. 259.

PILEUS 1-5 cm. broad, elongated in a *wedge-shaped to spathulate* manner, 2-10 cm. long, tapering to a stem-like base, *glabrous* except sometimes tomentose toward base, *whitish to brown, tan or reddish-brown*, margin at first inrolled and finely striate when moist. FLESH rather thin, white, homogeneous. GILLS decurrent, very narrow, crowded, whitish or yellowish, *edge fimbriate.* STEM not apparent from above, on the underside it is somewhat distinguishable as a compressed, short, somewhat villose portion on which the gills descend. SPORES *globose,* minute, 3-4 micr. in diameter, white in mass. CYSTIDIA abundant.

Caespitose on decaying wood, logs, stumps, from underground portions of wood, etc. July to September. Marquette. Infrequent.

Close to *P. spathulatus,* which has oval-elliptical spores. The European authors as a rule give the spores under the description of this species as oval-elliptical, so that if Peck's conception is correct their measurements were taken from a form like Peck's *P. spathulatus.* Fries and apparently most others have considered *P. spathulatus* as a variety with a more broadly expanded and lobed pileus. Our species is distinguished from *P. porrigens* and *P. albolantus* by the presence of cystidia, as well as by the non-resupinate pileus in the young stage.

708. Pleurotus spathulatus (Fr.) Pk.

N. Y. State Mus. Rep. 39, 1886.

Illustration: Hard, Mushrooms, Fig. 120, p. 108, 1908. (As *P. petaloides.*)

"PILEUS 1-5 cm. broad, ascending, spathulate," petaloid, subflabelliform, "tapering behind into the stem, glabrous, convex or depressed on the disk and there sometimes pubescent, *alutaceous* or *brownish tinged with gray, red or yellow.* FLESH rather thin. GILLS decurrent, crowded, linear, whitish or yellowish. STEM compressed, sometimes channeled above, grayish-tomentose. SPORES *elliptical,* 7.5 x 4-5 micr. ODOR and TASTE *farinaceous.*"

This description was taken from Peck's Report. It is submitted, so that more data may be obtained on the relation of this and the preceding species. Patouillard's figure of *P. petaloides* var. *lobatus* (Tab. Analyt., No. 421) may be this species, as he figures the spores elliptical-ovate. Hard gives the spore measurements elliptical, although he says "globose." His figure could be either species. Galtfelter (Trans. St. Louis Acad. of Sci., Vol. XVI, No. 4, p. 44) gives the spores of *P. petaloides* as 3-4 micr., and globose. There is thus considerable discrepancy between European and American notices of *P. petaloides,* so that Peck appears justified in separating the one with globose spores from the one with elliptical spores. It is more than likely, however, that American authors have confused *Panus angustatus* Berk. with *P. petaloides* in which case *P. spathulatus* would revert to *P. petaloides* as a variety, just as Fries placed it, and the elliptical spores would belong to *P. petaloides* as in Europe. All these species are doubtless edible so that the mycophagist is unaffected by the situation. Both *Panus angustatus* and *Pleurotus petaloides* have abundant cystidia, and both have been found in northern Michigan.

709. Pleurotus candidissimus B. & C.

Ann. Nat. History, 1859.

PILEUS 2-18 mm. broad, flaccid, reniform or dimidiate, soft-membranous, ascending, convex then plane, attached laterally, *never resupinate,* subsessile i. e. stem very short, sometimes sessile, *pure white, pulverulent,* with a chalky lustre, villose at point of attachment, *margin sulcate,* varying to rugose-striate. GILLS radiating, decurrent, *subdistant to distant,* broader in front, narrowed to the villose base, thin, white. SPORES *globose,* 4-6 micr. diam., smooth.

Gregarious, on rotten wood. Mixed hemlock, maple and beech woods. Houghton, Bay View, New Richmond. July to September. Infrequent.

This little species is easily mistaken for *P. septicus* from which it differs in its globose spores and its sulcate and non-resupinate pileus. The pileus may become resupinate on drying or when old. It varies from sulcate to obscurely striate or lacunose-rugose, but vigorous specimens show this character well. Other Friesian species differ as follows: *P. mitis* has an even pileus; *P. limpidus* is hygrophanous and the gills are crowded and linear; and *P. acerosus* has

crowded gills. Our plant seems to be overlooked usually, as it is delicate and soon shrivels.

Section III. Resupinati. Pileus at first resupinate, then reflexed, sessile.

**Pileus fleshy, rather thick; trama homogeneous.*

710. Pleurotus porrigens Fr.

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde, Vol. III, No. 100. Cooke, Ill., Pl. 259.

PILEUS 2-4 cm. broad, elongated ear-shaped, obovate or fan-shaped, 3-8 cm. long, *at first resupinate* and suborbicular *with persistently inrolled margin,* then reflexed and prolonged, ascending or horizontal, *pure white, sessile, glabrous* except the base which is villose-tomentose, margin regular or lobed. FLESH thin, rather brittle. GILLS radiating, *narrow, crowded,* linear, thin, *much forked* or even anastomosing at base, at length creamy-yellowish. SPORES slightly longer than wide, oval, or subglobose, 6-7 x 5-6 micr., smooth. CYSTIDIA none.

Caespitosely imbricated. On decayed wood of conifers. In the hemlock and pine regions of the State. August-September.

Easily confused with *Panus angustatus* and *Pleurotus albotomentosus.* It differs from these in the absence of a gelatinous layer in the pileus. From *P. petaloides* it is distinguished by its white color and absence of cystidia on the gills. Its home is usually on very rotten wood of hemlock or pine. *P. nephrctus* Ell. is said to be the same thing.

711. Pleurotus septicus Fr.

Syst. Myc., 1821.

Illustrations: Patouillard, Tab. Analyt., No. 627. Cooke, Ill., Pl. 259.

PILEUS 5-20 mm. broad, *resupinate at first,* then reflexed, convex then plane, *short-stipitate, white, pubescent, even on margin.* FLESH thin, not truly membranous. GILLS *subdistant, rather*

broad, radiating, white. STEM slender, short, incurved, *pubescent,* disappearing, surrounded at the base by a webby zone of filaments, white. SPORES elliptic-ovate, pointed-apiculate, *8-10 x 6 micr.,* white in mass. CYSTIDIA none.

On decaying wood, etc., in woods. Probably throughout the State. July-September. Infrequently found.

Often confused with *Claudopus variabilis* when the latter is young and white-gilled. It has no doubt also been mistaken for *P. candidissimus* which however is not resupinate at first and has globose spores. Probably several other small white species occur, but have not been distinguished.

***Pileus fleshy, with a gelatinous layer on or just beneath the surface.*

712. Pleurotus albolanatus Pk., sp. nov.

Illustration: Plate CXLV of this Report.

PILEUS 5-10 cm. or more broad, *resupinate at first,* fleshy, lateral, sessile, becoming obovate, reniform or flabelliform, convex to subexpanded, trama slightly differentiated into several layers, *upper part subgelatinous,* surface *pulverulent-tomentose,* margin involute at first. FLESH rather thin, white, scissile, *becoming brittle.* GILLS decurrent on stem-like base, *very crowded, narrow,* white to yellowish, somewhat forked, thin. SPORES *spherical,* 4-6 micr. diam., smooth, white in mass. CYSTIDIA *none.*

Caespitosely imbricated. On decaying logs of beech, hemlock, etc., of northern Michigan. Bay View, Marquette, Houghton. August-October. Frequent.

This species approaches *Panus angustatus,* but differs consistently in the lack of cystidia, in its larger spores, and perhaps in its resupinate pileus. No record seems to be on hand that *P. angustatus* is at first resupinate. The pileus has a gelatinous feel and is composed of several layers, but in some specimens these are hard to distinguish. Specimens referred to Peck, were labelled by him *P. porrigens* var. *albolanatus.* The spherical spores, which are constant, and the subgelatinous layer in the upper part of the pileus warrant me in using Peck's varietal name for a distinct species. Luxuriant specimens become lobed as in the related species, and measure up to 14 cm. in width. The flesh becomes brittle on drying and is rather thin throughout. The tomentosity extends usual-

ly over the whole pileus but sometimes the margin is glabrous. There are no striations. Sometimes the base arises from a white, mycelioid subiculum.

713. Pleurotus mastrucatus Fr.

Syst. Mycol., 1821.

Illustration: Cooke, Ill., Pl. 243.

"PILEUS 2.5-10 cm. broad, *at first resupinate* then reflexed and expanded, sessile, subdimidiate, obovate, sometimes lobed, flaccid, *trama with an upper gelatinous layer,* mouse-gray, *rough-squamulose with blackish* hairs and rigid points intermixed, margin involute at first. GILLS converging to the base of pileus, (without a rudimentary stem), broad, subdistant, whitish-gray. SPORES oblong, oblique, 8-9 x 4-5 micr., white.

"Caespitosely imbricated. On logs or decaying wood. September-November."

This species has been found in surrounding States and no doubt occurs with us, though I have not found it. Reported in the Chicago Nat. Hist. Surv. Report, and in Morgan's Flora of the Miami Valley, Ohio. It is rare.

714. Pleurotus atrocaeruleus Fr. var. griseus Pk.

N. Y. Mus. Rep. 44, 1891. (Syst. Myc., 1821.)

PILEUS 2-5 cm. broad, *at first resupinate,* then reflexed and horizontal, obovate or reniform, *upper layer of trama gelatinous and tough,* dark grayish-brown shaded with bluish or blackish tints, *coarsely villose* toward the base, glabrous on margin, even or slightly wrinkled, margin often lobed. FLESH stratose, gelatinous above, composed of floccose-hyphae below, the lower layer varying in thickness, thinner in front. GILLS radiating, decurrent to the region of the attachment of pileus or to the hairy stem-like base, moderately broad, somewhat close, whitish or yellowish, edge minutely fimbriate. SPORES elliptic-oblong, narrower toward one end, 6-7.5 x 3-4 micr., smooth, white in mass. CYSTIDIA slender, acuminate and scattered on the sides of gills and then about 45 micr. long; more numerous but shorter, about 30 micr., on the edge of the gills, often capped with coarse granules.

(Dried: Pileus blackish, gills ochraceous-tan.)

Caespitose, subimbricate, on the bark of various trees, in woods, lawns, etc. On mountain ash on a lawn at Marquette. July-September. Throughout the State. Infrequent.

The plants, like the plants of the genus Marasmius, revive when moistened. Mounted in water under the microscope, a section through the pileus shows a gelatinous upper layer of uniform thickness, bounded by dark hyphae on both sides of this layer, the upper hyphae forming the villosity on the pileus, the lower forming an opaque line next to the white flesh beneath. In front the flesh is thinner than the pellicle, behind it is several times thicker. Whether the variety is entirely distinct from the European species, cannot be decided from data at hand. The cystidia are thick-walled, slender, penetrate deep into the subhymenium, and do not project far above the hymenium.

715. Pleurotus applicatus Fr.

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 111, p. 109, 1900.
Hard, Mushrooms, Fig. 125, p. 162, 1908.
Cooke, Ill., Pl. 244.
Patouillard, Tab. Analyt., No. 519.

PILEUS 3-6 mm. broad, *minute,* arising from an orbicular resupinate tubercle, soon horizontal but *cupulate,* convex, submembranous, *trama mainly gelatinous,* surface pruinate to villose behind, obscurely striatulate, *dark gray to blackish,* tinged blue, sessile or with a villose, base-like tubercle. GILLS *subdistant,* relatively broad, radiating, whitish at first, soon gray or even darker than the pileus. SPORES spherical, minute, 4-5 micr. diam., smooth, white in mass. CYSTIDIA none.

Gregarious, on rotten wood, often on old stems of grape vines, in moist woods. Probably throughout the State; Ann Arbor, etc. June-September. Infrequently collected.

The dark color of this little Pleurotus causes it ordinarily to escape detection, but persistent examination of the lower side of moist logs or brush-heaps is likely to disclose it. It revives on moistening, and so simulates a Panus. It differs from *P. atropellitus* in its globose spores and gelatinous trama. A large portion of the thin pileus is composed of gelatinizing hyphae, on the top of

which are dark floccose threads which form the villose surface of a part of the pileus. The gills are subdistant with alternating shorter gills, which often develop poorly so that the main gills appear quite distant. When growing from the underside of wood the pileus is attached at its center.

****Pileus membranous, trama homogenous, not gelatinous.*

716. Pleurotus atropellitus Pk.

N. Y. State Mus. Rep. 39, 1886.

PILEUS 5-15 mm. broad, small, *resupinate at first,* very thin, membranous, toughish, suborbicular, then obovate or reniform, convex to nearly plane, *villose-tomentulose,* glabrescent in front, sessile by a villose tubercle, ashy-gray to blackish, *widely-striate to subsulcate on margin* when moist. FLESH homogeneous, with dark hyphae on the surface of pileus. GILLS close to subdistant, relatively broad, short ones often narrow, concolor, radiating from the stem-like villose base. SPORES *elliptical-oval,* 7-9 x 4-5 micr., smooth, white in mass. CYSTIDIA none.

On decayed wood, low woods. New Richmond, Ann Arbor. March (21, 1909), September, etc. Infrequent.

This is similar to *P. applicatus,* but more flaccid, more definitely striate on the pileus, and with broadly elliptical spores. Our plants were paler than those described by Peck. The closeness of the gills varies in these small plants and makes a poor character to emphasize. It revives poorly when moistened as compared with *P. applicatus.* Another small species, related to these two, is *P. niger* Schw. This has subglobose spores and is plicate on the margin of the pileus. *P. striatulus* Fr. has very distant gills, subglobose spores and a pendulous, obconic, striate brown or ashy pileus. I have not found these two in the state.

Tricholoma Fr.

(From the Greek *thrix,* genitive *trichos,* a hair; and *loma,* a fringe, referring to the remnants of the cortina in some species.)

White-spored. Stem continuous with the pileus, *without an annulus, spongy-fleshy to fibrous,* central; partial veil in the form of a slight fibrillose or floccose cortina, or lacking. Volva none. Gills

adnate or truncate-adnexed, *becoming emarginate.* Pileus viscid or dry.

Putrescent, *terrestrial,* fleshy, firm and rather large mushrooms. A large genus, approaching Clitocybe and Pleurotus, being separated from the former by the non-decurrent gills, from the latter by the central stem. Collybia is distinguished by its cartilaginous stem, and by the absence of a cortina, and more often grows on wood or decayed leaves, etc. The trama of the gills is composed of parallel hyphae which distinguishes them from those Hygrophori which are similar in appearance. The genus corresponds to Hebeloma, Entoloma and Hypholoma of the ochre, pink and purple-spored groups. Many of them are edible, and their thick flesh furnishes considerable substance; on the other hand several species are known to be poisonous and must be avoided.

The PILEUS may be glabrous, silky or in some species scaly; viscid, dry or hygrophanous. Accordingly they are placed under *corresponding sections* of the genus. The colors are seldom bright, although several are sulfur-yellow and others purplish or lavender. Many of them are dull whitish to gray or tan, sometimes umber or blackish. The character of the *margin of the pileus* is used extensively to determine to which sub-genus they belong. It is, therefore, important to observe carefully the presence or absence of silky fibrils or flocci on the margin, as their presence indicates a slight *cortina* in the very young stage and suggests the sub-genus Cortinellus. The viscidity indicates the subgenus Limacina, although species of other sections sometimes become slightly viscid or gelatinous in very wet weather. The GILLS are used to separate this genus from Clitocybe. Theoretically, they are always *emarginate* behind, but this condition varies considerably. It is true, that in the mature plant, when the pileus is fully expanded, they become either sinuate or emarginate in most cases, although a single specimen may not always be normal in this respect. When young, however, they often do not show this character clearly, but are then adnexed, rounded-adnate, or adnate in such a way that they are merely a little less broad at the attached portion than they are a few millimeters away from the stem, and this short distance is often marked by a straight edge rather than by a rounded edge. Such a condition may be referred to as *truncately-adnate,* rather than as adnexed. In old stages the gills may even become spuriously decurrent, and their Tricholoma nature is then evident only by a slight sinuate portion near the stem, since in Clitocybe the

edge is uniformly continuous or straight. Fayod (Ann. d. Sci. Nat., 7 Ser., Vol. 9, p. 346), says that in the very young button stage they are truly decurrent but his observations were limited to few species. The *color of the gills* changes at maturity or in age in some species, and this character is used to separate the species under each section into two groups. The color changes to reddish-spotted, flesh-color, ashy or even black in age or when bruised, and hence it is often impossible to locate a species properly until it has been kept several hours after picking. In some species the gills are very narrow; in others, very broad, and this is a reliable character when well-developed plants are at hand; poorly-developed or stunted specimens often produce narrow gills in broad-gilled species. The gills of some species are easily separable from the trama of the pileus, and such species have been referred by some authors to a separate genus: Lepista. There is, however, not sufficient data at hand to know with certainty what species have this character and why, and hence in this report they are included under Tricholoma. The STEM varies from fibrous-fleshy to fibrous-spongy; more often quite firm, compact and stout. It lacks the cartilaginous rind of the stem of Collybia, although in dry weather forms a rind is sometimes simulated. *T. albiflavidum* Pk. often has a distinct cartilaginous stem and is grouped under Collybia. There is no annulus, the cortina being evanescent when present at all, or in a few extreme cases leaving only slight fibrillose remnants on its surface, as in *T. vaccinum* Fr. and *T. imbricatum* Fr. It is nearly always dry, and scarcely ever sharply bulbous. The SPORES are white except in a small aberrant group including *T. personatum, T. nudum* and *T. panoeolum,* where they are tinged pale dingy-flesh color in mass. They vary from elliptical to oval or spherical, and are usually medium to small or minute in size. The epispore is rarely rough, e. g., in some of the species under the subgenus Melanoleuca. CYSTIDIA are lacking in this genus; *sterile cells* are seldom present on the edge of the gills; they have been noted in *T. rutilans* and *T. acre.* The ODOR is quite characteristic of many species; many have a farinaceous odor, while some are distinguishable by a heavy disagreeable odor. When it is not otherwise noticeable, the odor may often be obtained by crushing a piece of the cap between the fingers. The TASTE varies also. In those species with the farinaceous odor, there is a corresponding taste. Some species have an acrid taste. The Tricholomas usually have a terrestrial *habitat.* They are most

common in open woods, mossy places and thick forests. Some grow in meadows or grassy places, but these are rare in the vicinity of Ann Arbor. *T. rutilans* grows on wood, and *T. ustale* is partial to the remains of very rotten logs, etc. Their EDIBILITY varies. Some of them, like *T. resplendens* and *T. personatum* are among our very best mushrooms for the table. Others like *T. equestre, T. transmutans, T. sejunctum* and *T. terreum* are fairly good when properly cooked. Some, such as *T. laterarium*, are very bitter, or have various kinds of disagreeable flavors which, however, almost disappear in cooking. In serving those mushrooms of disagreeable flavor it is safer to discard the liquid in which they were prepared, as this contains the objectionable constituents. In several species, of which *T. sulfureum* is an example, the disagreeable flavor cannot be removed, and such should not be eaten. In all cases, except those species which are well-known, it is necessary to exercise extreme caution, since the genus includes several *poisonous* species. *T. venenatum* for example, has a mild taste and odor, and is yet known to cause severe sickness. Many of those with a farinaceous taste and odor, on the other hand, are known to be edible. One must therefore be able to discriminate in order to be on the safe side.

The grouping of this large genus is fraught with considerable difficulties. The separate species are often closely related, and some of them approach other genera in such a way as to cause disagreement among authors as to their generic position. I have attempted an arrangement along conservative lines until our data are more complete. The species included in this report do not, I am sure, represent more than half the species occurring within the State. It has been impossible to make a search for Tricholomas in the northern part of the State in the late fall, so that doubtless that region is poorly represented. Hence, also, it was impossible to study the genus in such a way as to form a definite opinion as to the value of various arrangements which have been proposed. Some have segregated it into four or more genera. Others have separated those species with rough spores under the genus Melanoleuca, while still others have placed those species in which the gills separate easily from the trama of the pileus under Lepista Fr. The most natural arrangement with the data at hand, seems to be a division into subgenera, based on (1) the viscid pileus: Limacina; (2) the dry pileus, with a fibrillose cortina when young: Cortinellus; and (3) the moist or hygrophanous pileus: Melano-

leuca. I am inclined also to consider those with separable gills as a distinct subgenus, but have avoided that arrangement in this report for lack of data.

The key to the species includes a number which have not yet been found in Michigan but which occur in neighboring States.

Key to the Species

(A) Pileus viscid, medium to large. [See also (AA) and (AAA).]
(a) Pileus pure white. 721. *T. resplendens* Fr.
(aa) Pileus not pure white.
(b) Gills sulfur-yellow; pileus not virgate. 717. *T. equestre* Fr.
(bb) Gills not sulfur-yellow.
(c) Gills becoming discolored in age, often spotted with brownish-red.
(d) Flesh and gills yellowish; stem at first viscid; pileus brown. *T. flavobrunneum* Fr.
(dd) Flesh and gills white at first.
(e) Pileus pale pink to rosy-red, margin at first involute. (See 163. *Hygrophorus russula* Fr.)
(ee) Pileus reddish-brown to bay-brown.
(f) Odor distinctly farinaceous when flesh is crushed; taste of surface of pileus bitter. 722. *T. transmutans* Pk.
(ff) Odor not farinaceous; stem mostly rooting. 723. *T. ustale* Fr.
(cc) Gills not discolored, not rufescent.
(d) Pileus streaked with innate blackish fibrils.
(e) Taste bitterish or nauseous; pileus whitish to yellowish. 718. *T. sejunctum* Fr.
(ee) Taste mild; pileus gray, smoky, lurid. 719. *T. portentosum* Fr.
(dd) Pileus not streaked.
(e) Stem floccose-fibrillose; pileus alutaceous. 720. *T. terriferum* Pk.
(ee) Stem glabrous.
(f) Pileus slightly viscid, greenish-yellow; stem white. *T. intermedium* Pk.
(ff) Pileus glutinous, yellow-tawny, disk reddish-brown; base of stem brown. *T. viscosum* Pk.

(AA) Pileus hygrophanous (water-soaked plants of the (AAA) group sometimes have an hygrophanous appearance).
(a) Stem sulcate or coarsely striate; pileus reddish or reddish-fawn color (moist), 5-10 cm. broad. *T. grammopodium* Fr.
(aa) Stem not sulcate; pileus usually less than 6 cm. broad.
(b) Gills violaceous (young), then smoky; often in greenhouses, gardens, etc. 754. *T. sordidum* Fr.
(bb) Gills not at first violaceous.
(c) Pileus 1-3 cm. broad, stem hollow.
(d) Pileus olive-gray (moist); odor of rancid meal. *T. putidum* Fr.
(dd) Pileus watery-brown (moist); odor farinaceous. *T. rimosum* Pk.
(cc) Pileus 3-7 cm. broad.
(d) Odor strongly farinaceous; pileus grayish-brown or brown (moist); gills whitish. 753. *T. leucocephaloides* Pk.
(dd) Odor not farinaceous.
(e) Stem brown within and without, short; pileus ashy, grayish-brown, darker on disk. *T. brevipes* Fr.
(ee) Stem whitish within; in fields, gardens, open ground, etc.

(f) Stem streaked with blackish fibrils, elastic; pileus smoky-brown. 752. *T. melaleucum* Fr.
(ff) Stem covered with a cinereous pulverulence, soft; pileus gray. *T. humile* Fr.

(AAA) Pileus neither viscid nor hygrophanous.
(a) Pileus white or whitish at first, disk often with tints of other colors.
(b) Taste acrid, bitter or unpleasant (often tardily).
(c) Gills becoming dingy flesh color. 751. *T. panoeolum* var. *caespitosum* Bres.
(cc) Gills white or whitish, not becoming dingy incarnate in age.
(d) Stem stuffed or hollow; pileus with grayish-brown disk; taste and odor strong, unpleasant. *T. terreolens* Pk.
(dd) Stem solid.
(e) Gills broad; pileus minutely scaly; taste slowly acrid or unpleasant.
(f) Pileus with ochraceous, drop-like scales on disk. 726. *T. nobile* Pk. (*T. serratifolium* Pk.) (See also *T. venenatum* Atk.)
(ee) Gills not broad; pileus glabrous.
(f) Taste very bitter; gills narrow and crowded. 743. *T. acerbum* Fr.
(ff) Taste tardily acrid; gills medium broad and close. 742. *T. album* Fr.
(bb) Taste mild or farinaceous.
(c) Stems connately joined at base or several growing from a thick fleshy mass.
(d) Pileus mottled with reddish scaly spots. *T. albellum* Fr.
(dd) Pileus mottled with watery spots. 741. *T. unifactum* Pk. var.
(cc) Stems simple or subcaespitose.
(d) Pileus small; gills broad; stem solid; taste farinaceous. *T. silvaticum* Pk.
(dd) Pileus usually more than 2-3 cm. broad.
(e) Odor and taste farinaceous.
(f) Pileus large, 8-12 cm., scaly with brownish scales; spores 9-11 x 6 micr. *T. grande* Pk.
(ff) Pileus 3-6 cm., glabrous; spores 6-8 x 3-4 micr. 745. *T. leucocephalum* Fr.
(ee) Odor and taste mild.
(f) Stem rooting and tomentose at base. *T. lascivum* Fr.
(ff) Stem not rooting. (*Clitocybe candida* Bres. may be sought here.)
(g) Margin of pileus with short, radiating ridges; gills narrow and crowded. 744. *T. laterarium* Pk.
(gg) Margin even.
(h) Gills rather broad.
(i) Plant pure shining white, but without a separate pellicle. 727. *T. columbetta* Fr.
(ii) Plant dingy whitish, pileus fibrillose-scaly. 725. *T. venenata* Atk.
(iii) Plant whitish, caespitose. (See 774. *Clitocybe multiceps.*)
(hh) Gills narrow and crowded, pileus not pure white; stem striate. (See 813. *Collybia albiflavidum* Pk.)
(aa) Pileus yellow, yellowish or smoky-yellowish. [See also (aaa).]
(b) Growing on wood; edge of gills flocculose.
(c) Pileus yellow beneath the dark reddish scales. 724. *T. rutilans* Fr.
(cc) Pileus pale yellow, slightly silky. *T. flavescens* Pk.
(bb) Growing on the ground.
(c) Odor strong of coal tar, etc., disagreeable or farinaceous.

(d) Plant sulfur-yellow to olivaceous-yellow; odor disagreeable, strong. 737. *T. sulfureum* Fr.
(dd) Plant pale yellow or smoky-yellow.
(e) Stem solid; gills yellowish, taste farinaceous. 738. *T. chrysenteroides* Pk.
(ee) Stem stuffed or hollow; gills rather broad.
(f) Pileus smoky-yellowish; taste and odor farinaceous; gills white. 746. *T. fumosiluteum* Pk.
(ff) Pileus pale yellow; gills whitish tinged pink; odor rather strong. 739. *T. odorum* Pk.
(cc) Odor none or slight.
(d) Pileus large, 4-10 cm.
(e) Pileus very fragile, bright yellow, variegated with other hues; gills broad, white. *T. davisiae* Pk.
(ee) Pileus firm, yellow, umbonate; gills white; stem solid, white within; spores globose. *T. subluteum* Pk.
(dd) Pileus small, 1-3 cm., dull saffron; gills yellow. *T. fallax* Pk. (See also *T. cerinum* Fr.)
(aaa) Pileus neither white, whitish, yellow nor yellowish.
(b) Pileus violet, lilac or purplish.
(c) Pileus 6-12 cm. broad; stem stout, lavender or lilac; common. 747. *T. personatum* Fr.
(cc) Pileus smaller; stem more slender.
(d) Pileus at first conic-campanulate and flocculose on the margin; gills whitish. *T. ionides* Fr.
(dd) Pileus at first convex and naked on margin, gills bluish to lavender. 748. *T. nudum* Fr.
(bb) Pileus not violet, lilac or purplish.
(c) On wood or rotten logs.
(d) Pileus covered with dense, minute, blackish or brownish scales; flesh yellow. (See 760. *Clitocybe decora* Fr.)
(dd) Pileus covered with reddish tomentum or scales, flesh yellow. 724. *T. rutilans* Fr.
(cc) On the ground.
(d) Pileus cinereous, grayish-brown, smoky or blackish. [See (dd).]
(e) Gills becoming blackish or bluish-black when bruised. Pileus 2-7 cm. broad.
(f) Gills narrow, crowded. 733. *T. fumescens* Pk.
(ff) Gills moderately broad, close to subdistant. 734. *T. fuligineum* Pk.
(ee) Gills not becoming black when bruised; some changing to ashy, yellowish or flesh color in age.
(f) Taste acrid, peppery or disagreeable.
(g) Stem rooting; gills white; pileus grayish-brown, taste disagreeable. *T. radicatum* Pk.
(gg) Stem not markedly rooting.
(h) Pileus virgate with gray or blackish fibrils.
(i) Pileus acutely and prominently umbonate; gills and stem white. *T. subacutum* Pk. (cf. *T. virgatum* Fr.)
(ii) Pileus obtuse; gills at length pale cinerascent. 731. *T. acre* Pk.
(hh) Pileus not virgate.
(i) Pileus buff, grayish-brown or dingy-tan, large, caespitose; gills crowded, narrow, soon flesh color. 571. *T. panoeolum* var. *caespitosum* Bres.
(ii) Not caespitose; pileus livid-brown; flesh of stem becoming reddish. 735. *T. saponaceum* Fr.
(ff) Taste mild or farinaceous.
(g) Very large; pileus 10-20 cm. broad, grayish-tawny; stem rooting. *T. grave* Pk.

(gg) Moderate size.
(h) Pileus 2-6 cm. broad, innately fibrillose or fibrillose-scaly. 732. *T. terreum* Fr.
(hh) Pileus 5-10 cm. broad.
(i) Pileus smoky-umber to blackish; gills broad, cinerascent. 736. *T. laticeps* sp. nov.
(ii) Pileus grayish or grayish-brown.
(k) Gills broad, subdistant.
(l) Streaked with darker fibrils; gills white. (See 816. *Collybia platyphylla* Fr.)
(ll) Pileus usually water-spotted not streaked; gills slightly cinerascent; autumnal. 749. *T. tumidum* Fr.
(kk) Gills close or crowded.
(l) Gills easily separable from flesh of pileus, becoming dingy-yellowish in age; stem stuffed. 751. *T. cinerascens* Fr.
(ll) Gills not separable, veined on the sides. *T. patulum* Fr.
(dd) Pileus reddish, tawny, tan, fuscous-livid, etc.
(e) Growing on wood; pileus and stem covered with tawny, tomentose scales. *T. decorosum* Pk.
(ee) Not on wood.
(f) Flesh of pileus or stem changing to reddish when bruised or in age; pileus red-brown.
(g) Stem hollow. 729. *T. vaccinum* Fr.
(gg) Stem solid. 728. *T. imbricatum* Fr.
(ff) Flesh not turning reddish.
(g) Becoming ferruginous-stained when handled; pileus whitish to brownish. *T. submaculatum* Pk.
(gg) Not becoming rusty-stained.
(h) In pastures, etc., in the spring; pileus pale tan, watery-spotted; odor farinaceous. *T. gambosum* Fr.
(hh) In the woods.
(i) Pileus pale alutaceous to russet; gills pale yellow; stem white. 730. *T. tricolor* Pk.
(ii) Pileus flesh color, 1-2 cm. broad. 740. *T. carneum* Fr.

SUBGENUS I. LIMACINA. Pileus provided with a gelatinous pellicle, viscid, not hygrophanous. Cortina none.

**Gills not at length brown or rufescent-spotted.*

717. Tricholoma equestre Fr. (Edible)

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 72.
Berkeley, Outlines, Pl. 4, Fig. 2.
Gillet, Champignons de France, Pl. 672.
Ricken, Blätterpilze, Pl. 90, Fig. 3.

PILEUS 5-10 cm. broad, compact, convex-expanded, obtuse, pale

yellow, variegated with reddish or smoky-reddish especially on disk, *viscid,* somewhat scaly on broad disk, not virgate, margin even and naked. FLESH white or tinged yellow under cuticle, thin on margin. GILLS slightly adnexed or nearly free, rounded-truncate behind, *sulfur-yellow,* close, rather broad, ventricose, edge entire or suberoded. STEM stout, 3-6 cm. long, 1-2 cm. thick, equal or subbulbous, solid rarely cavernous, pale yellow or white, *white within,* even, minutely scaly or glabrescent. SPORES elliptical-oval, 6-7 x 4 micr., smooth, white. CYSTIDIA and *sterile cells* none. ODOR slight or none; TASTE subfarinaceous, tardily disagreeable.

Gregarious or subcaespitose. On the ground among or under leaves in conifer and frondose woods. Ann Arbor, Detroit, Jackson, Houghton, Marquette. August-October. (Earliest record July 28.) Infrequent.

This is usually a large and noble species, but late in the fall it is often found with smaller dimensions. The color of the stem is pale yellow or even white, but in Europe it is said to be sulfur-yellow, as is also the flesh. The scales on the pileus are not always developed. The margin of the cap is at first incurved and irregularly wavy. It differs from *T. sejunctum* by lacking the radiating sooty lines which characterize the pileus of that species, and by its yellow gills. It is found sparingly, and rather late in the fall. When covered with leaves the yellow color of the cap is more highly developed.

718. Tricholoma sejunctum Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 89, p. 88, 1900.
Hard, Mushrooms, Fig. 60, p. 82, 1908.
Cooke, Ill., Pl. 53.
Gillet, Champignons de France, No. 700.
Fries, Icones, Pl. 23 (luxuriant form).
Ricken, Blätterpilze, Pl. 89, Fig. 2.

PILEUS 4-8 cm. broad, convex-expanded, obtuse or umbonate, *subviscid,* whitish to yellowish, *streaked with innate blackish fibrils,* often gibbous or irregular. FLESH white or slightly yellowish, fragile. GILLS emarginate, *white,* usually broad, subdistant to close, edge entire. STEM elongated, 5-8 cm. long, 1-1.5 cm. thick, subequal or *variously thickened and flexuous,* solid, some-

times cavernous, subglabrous, even, white or tinged yellowish. SPORES oval to subspherical, 6-7 x 4-5.5 micr., white. CYSTIDIA none. ODOR slight; TASTE bitterish to nauseous.

Gregarious or subcaespitose. On the ground in oak and maple woods. Ann Arbor, New Richmond. September-November.

Frequent around Ann Arbor in the late fall. Usually this species is more slender than *T. equestre*. Its virgate pileus and white gills distinguish it from that species. The color is quite variable; sometimes the pileus is a dull white with a few yellow stains, while the other extreme, with the pileus almost entirely smoky-brown or blackish on disk, is equally common. The disk of the pileus sometimes develops blackish fibrillose scales while normally it is glabrous. In any case there is usually some sign of the streaked condition. Specimens have been found in which slight yellowish stains appeared on the edge of the gills in the older specimens, but these could not be referred to *T. coryphaeum* Fr. which species is said to have yellow-edged gills. Peck remarks that the taste is scarcely bitter. In our plants a bitterish-nauseous taste was nearly always present. *Tricholoma intermedium* Pk. is said to be halfway between *T. equestre* and *T. sejunctum,* and is distinguished by its crowded gills. It should be considered as a variety, since it is doubtless an example of the extreme variation of *T. sejunctum*.

719. Tricholoma portentosum Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 63, p. 87, 1908.
Michael, Führer f. Pilzfreunde, Vol. II, No. 93.
Peck, N. Y. State Mus. Mem. 4, Pl. 45, Figs. 1-5, 1900 (var. *centrale* Pk.)
Cooke, Ill., Pl. 54.
Gillet, Champignons de France, Pl. 692.
Fries, Icones, Pl. 24.
Ricken, Blätterpilze, Pl. 89, Fig. 3.

"PILEUS 6-12 cm. broad, convex-expanded, subumbonate, sometimes irregular and repand, *viscid,* even, glabrous, generally *fuliginous,* sometimes violet-tinged, *lurid,* virgate with innate black fibrils, margin always naked and thin. FLESH white, obsoletely lutescent, fragile. GILLS rounded behind, slightly adnexed, *broad* (up to 2 cm.), *distant* when mature, whitish at first, *finally yellow-*

ish or grayish-tinged. STEM 6-8 cm. long, 1-2 cm. thick, *stout,* firm, solid, subequal, *innately fibrillose-striate, whitish.* SPORES 6-7 x 3-4 micr., elliptical. ODOR none; TASTE *mild.*"

Said to occur in conifer woods. Perhaps in the northern part of the State.

It has not been found with certainty in America, but is reported by some American authors. The figures of European authors vary considerably as to color of cap. Schroeter says it is gray or rusty-brown; Gillet figures it pale gray with black lines radiating from center. In Michael and Fries' Icones, the gray color is mixed with a dark lurid hue. It is in the sense of the last author that the description taken from the Icones applies. The spore measurement is Schroeter's; the English authors give smaller measurements. According to Fries' Icones, and others (see Louis Maire, Bull. d. l. Soc. Myc. France, Vol. 26, p. 251) the lack of odor and taste separate it from *T. sejunctum.*

Var. *centrale* Pk. is said to have the sooty-brown color on disk only; elsewhere it is yellow or greenish-yellow. The gills are moderately broad and close, white or yellowish. The flesh is white and the taste is mild. Spores 7.5 x 5 micr. It has not been identified within our territory.

720. Tricholoma terriferum Pk.

N. Y. State Rep. 41, 1888.

PILEUS 6-12 cm. broad, convex-plane, irregular or wavy on margin, glabrous, *viscid, alutaceous,* even, margin at first incurved. FLESH white, thick on disk, thin on margin. GILLS adnexed, emarginate, *crowded,* thin, narrow, whitish, *not becoming rufescent.* STEM 2-3 cm. long, 1-2 cm. thick, equal or subequal, solid, *floccose-scaly at apex,* floccose-fibrillose elsewhere, white. SPORES *minute,* subglobose, 3 x 2 micr., white. CYSTIDIA none. BASIDIA 20-24 x 4-5 micr., 2 to 3-spored. TASTE and ODOR not marked.

Solitary or gregarious. Frondose woods. Detroit. October. Apparently rare.

Our specimens had a subhygrophanous character and the flesh was scissile. The minute spores separate it from related species. More data are needed to place this species on a firm footing.

721. Tricholoma resplendens Fr. (Edible)

Hymen. Europ., 1874.

Illustrations: Fries, Icones, Pl. 29.
Hard, Mushrooms, Fig. 504, p. 600, 1908.
Cooke, Ill., Pl. 55.
Gillet, Champignons de France, 695.

PILEUS 4-10 cm. broad, convex-plane, *viscid,* glabrous, *white, shining* when dry, even, margin naked and at first straight. FLESH white, rather soft, thin on margin. GILLS narrowly adnexed, emarginate, *close,* medium broad, ventricose, scarcely thickish, white, sometimes intervenose, edge entire. STEM 4-8 cm. long, 7-15 mm. thick, subequal or tapering downward, often subbulbous at base, *solid,* rarely with tubule or cavernous, glabrous, *dry,* even, white. SPORES 6-7.5 x 4 micr., short elliptical, smooth, white. CYSTIDIA and *sterile cells* none. ODOR and TASTE mild.

Gregarious or scattered. On the ground, in conifer or frondose woods. September-November (earliest record August 9). Marquette, Bay View, New Richmond, Detroit. Common in the vicinity of Ann Arbor.

The viscid pileus distinguishes this from other white Tricholomas of this size which have a mild taste and odor. Slender forms imitate *Hygrophorus eberneus,* but that has a glutinous or viscid stem. Stout forms approach *Hygrophorus sordidus* Pk. which, however, has more distant gills, a stouter stem and waxy decurrent gills. When dry, it imitates *Tricholoma columbetta,* but the pileus of the latter is said to become silky-fibrillose and the margin is at first involute and subsquamulose. The pileus is sometimes yellowish or hyaline-spotted on the disk. The stem tends to be variously curved toward base. The plant varies considerably and several *forms* have been found. (A) Pileus conical-ovate when young, then expanded and subacutely umbonate; stem fibrillose striate. Entirely white. In woods of white pine, beech, etc., at New Richmond. (B) Stem blue-spotted toward base, with a narrow tubule. Entirely white elsewhere, stature smaller than type. After frosts in the late fall. In oak, etc., woods, at Ann Arbor. This would seem to correspond to the blue-spotted form of *T. columbetta* mentioned by various authors; in our plant the pileus was distinctly viscid, and the stem dry. They grew under the fallen leaves during November. The spores of both these forms were typical.

***Gills becoming rufescent or reddish-spotted in age.*

722. Tricholoma transmutans Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, N. Y. State Mus. Rep. 48, Pl. 21, Fig. 1-5, 1896.

PILEUS 4-10 cm. broad, convex-expanded, obtuse, *surface of pellicle bitter,* brownish, *reddish-brown* or tawny-red, *viscid,* glabrous or nearly so. FLESH white, rufescent in age, thin on margin. GILLS adnexed, emarginate, narrow, close, whitish or pale-yellowish, *at length rufescent or reddish-spotted,* finally sordid-blackish. STEM 6-8 cm. long, 6-12 mm. thick, equal or subequal, dry, glabrous or subfibrillose, *whitish or rufescent, solid,* sometimes cavernous above. SPORES oval-globose, 5 x 4 micr., sometimes nucleate. CYSTIDIA none. ODOR and TASTE of flesh distinctly *farinaceous,* pellicle of cap bitter.

Gregarious, scattered or subcaespitose. On the ground in frondose woods, sometimes *forming mycorhiza on the roots of the black oak.* Ann Arbor, Jackson, Detroit, New Richmond. September-October (earliest record August 9). Common in southern Michigan.

It is related to the European species *T. flavobrunneum* Fr. and *T. frumentaceum* Fr. which possess a farinaceous odor. The former has a viscid stem at first and the flesh is usually yellow. As to *T. frumentaceum,* there seems to be some uncertainty. The English authors say the spores are elliptical, and Cooke figures it as an Entoloma (Ill., Plate 470). That cannot be our plant. On the other hand, continental authors are silent as to the size of spores, although Barla mentions a variety with spherical spores. The stem of *T. transmutans* is usually solid, but often tunnelled by grubs in warm weather. When growing in the open, in pastures, etc., it is usually tufted and the pileus is irregular. It is said to be excellent eating.

723. Tricholoma ustale Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 26.
Cooke, Ill., Pl. 88.
Michael, Führer f. Pilzfreunde, Vol. III, No. 115.
Ricken, Blätterpilze, Pl. 88, Fig. 3 (represents form B.).
Plate CXLVI of this Report.

PILEUS 4-10 cm., broadly convex, obtuse or subumbonate, subgibbous, *reddish-bay to dark chestnut,* sometimes paler, viscid, *naked, even,* not virgate nor scaly, margin persistently incurved. FLESH *white,* thickish, firm, rufescent. GILLS adnate-seceding or emarginate, moderately broad, *crowded, pure white at first* then rufescent or *reddish-brown when bruised,* edge eroded. STEM 5-8 cm. long, 8-15 mm. thick, subequal or irregularly compressed, *often rooting, stuffed,* sometimes hollow, white, becoming reddish downwards, *floccose-pruinose,* sometimes twisted. SPORES elliptical-ovate, 6-8 x 4-5 micr., white. CYSTIDIA and *sterile cells* none. ODOR *none;* TASTE *bitter.*

Solitary or subcaespitose. On very decayed wood or leaf-debris in conifer or frondose woods. Ann Arbor, New Richmond. September-October. Rare.

This is allied to the European species *T. flavobrunneum* and *T. pessundatum* which are said to possess a distinct farinaceous odor, while in *T. ustale* this odor is lacking. From *T. transmutans* it is separable by the spores and the rooting stem. Two forms—already mentioned by Fries (Icones)—have been found in the State. (A) Large, with the base of the stem ending in a root-like prolongation which is 2-5 cm. long, and occurs in conifer woods (white pine). (B) Smaller, with a narrowed, short subrooting base, growing in frondose woods. Form (A) is illustrated by Plate CXLVI, and is rather well represented by Cooke's figure of *T. flavobrunneum* (Ill., Plate 58), which may be the same plant. There was no yellow present in our specimens.

SUBGENUS II. CORTINELLUS. Pileus *dry,* not absorbing water, nor hygrophanous; silky, fibrillose or somewhat scaly, sometimes subglabrous. Margin of pileus slightly fibrillose or floccose with remains of an evanescent cortina, except in species of "Rigida."

Cortinellus has been raised to the rank of an independent genus

by some authors, e. g. Roze, (Bull. de la Soc. bot. de France, 1876), Schroeter, (Die Pilze Schlesians, Vol. 1, 1885), and Earle, (Bull. N. Y. Bot. Garden, Vol. V., 1908). The first two authors include only species whose cortina is sufficiently developed to leave a slight ring on the stem. Earle extended it as above. It seems better to keep the species which belong here subordinate on account of their close relation to the genus Tricholoma as a whole. Some of its species need further study to determine their exact position. The following sections are taken in the sense of Fries.

Section I. Genuina. Pellicle of pileus torn into fibrillose or floccose scales, its margin at first involute.

***Gills not becoming rufescent, cinereous nor blackish.*

724. Tricholoma rutilans Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 89.
Gillet, Champignons de France, No. 697.
Michael, Führer f. Pilzfreunde, Vol. I, No. 54.
Ricken, Blätterpilze, Pl. 91, Fig. 1.

PILEUS 4-8 cm. broad, campanulate-expanded, dry, at first covered with a purplish-red tomentum, *soon tomentose-scaly with dark reddish scales* on the yellowish surface beneath, margin at first involute. FLESH yellow, moderately thick. GILLS rounded-adnate then emarginate, *crowded,* rather narrow, *yellow or golden-yellow,* thickish, *edge flocculose.* STEM 5-10 cm. long, curved, equal, stuffed then hollow, yellow or yellowish within and without or *variegated with minute reddish tomentose scales,* even. SPORES oblong, 6-7 x 3-4 micr., white. CYSTIDIA none; *sterile cells* on edge of gills numerous, large, clavate-inflated, narrowed toward base, 65-100 micr. long, 15-20 micr. thick above. ODOR and TASTE mild.

Solitary or caespitose on decaying wood of pine, balsam and hemlock. Isle Royale, Bay View, Houghton, New Richmond. July-October. Infrequent.

This is one of the few species of Tricholoma inhabiting wood It also departs from the other Tricholomas in having well-developed sterile cells on the edge of the gills, a modification which

causes the fine floccosity and is sometimes abnormally developed. The fine tomentum of the pileus is seen under the microscope to be composed of long, intertwined fibrils filled with reddish-yellow substance. This covering of pileus and stem in well-developed specimens is quite marked and represents a sort of universal veil. This species must not be confused with *Clitocybe decora* Fr., in which the gills do not become emarginate, and the scales are blackish-brown and fibrillose.

Var. *variegatus* (*T. variegatus* Fr.). Differs in smaller size, gills white or whitish, scarcely tinged yellowish, and without sterile cells. Flesh white or yellowish-white. New Richmond. Infrequent. In both the color varies somewhat, and the reddish scales are sometimes practically lacking on the stem.

725. Tricholoma venenata Atk. (Poisonous)

Botanical Gazette, Vol. 46, 1908.

"PILEUS 4-7 cm. broad, convex-expanded, subumbonate, center fleshy, moist, not viscid, *pale buff to clay-color,* minutely scaly with fibrous scales, with a subtomentose area over the center, the scales possessing the darker color, under the lens some of them appear nearly black. FLESH white with a dull clay-colored tinge and stain. GILLS adnexed, broadly sinuate, subdistant, whitish, thin, *dull clay color where bruised.* STEM subbulbous, with a bulb like that of *Lepiota lenticularis* (see *L. fisheri*), fibrous-striate, solid, sordid white, becoming *dull-clay color* in age or when handled. SPORES oval to broadly elliptical, smooth, 5-7 x 3.5-5 micr., white. CYSTIDIA none. ODOR and TASTE mild."

Gregarious. On the ground in frondose woods. Rochester, Oakland County. September.

This *poisonous* Tricholoma caused severe illness of a family at Rochester, Michigan, who were advised that it was harmless because of its mild taste and odor. The species was not known to the persons to whom it was referred but it was thought to be a Tricholoma and hence, since mushroom amateurs usually think that the species of that genus when mild are perfectly safe, they felt safe in its use. It is only another case in favor of the argument that it is necessary to know mushrooms by their specific distinctions, and to use only those whose identity is known to the user. Better learn a few species well than take chances. The description is adapted from that of Atkinson,

and was made from some of the specimens growing in the same place as those which caused the sickness. It does not have very striking characteristics, but can be distinguished by the tendency of the plant to assume an ochraceous or dull clay color in age or when bruised. Specimens which were doubtless the same species were collected at Ann Arbor, September, 1907, and August, 1909, and were at first thought to be *T. nobilis;* the spores, however, were found to be elliptical and the plants could not be placed until after the publication of Atkinson's species. The spores of our plants were up to 8.5 micr. long, the gills rather broad, and the pileus covered with delicate ochraceous, fibrillose scales except toward the margin which was silky-fibrillose to silky-tomentose. There was no odor at first, but a slight, disagreeable odor developed. The species seems closely related to the following, and apparently imitates it in its general appearance. Hence both species should be let alone.

726. Tricholoma nobile Pk. (Suspected)

N. Y. State Mus. Rep. 42, 1889.

Illustration: Plate CXLVII of this Report.

PILEUS 5-10 cm. broad, convex-expanded, subplane, obtuse, dry, whitish, *dotted by minute, drop-like grayish-ochraceous scales,* at least on disk, even, margin irregularly-wavy at maturity. FLESH pure white, thick on disk, brittle, thin on margin. GILLS truncate-adnate, varying emarginate-adnexed to spuriously decurrent, *broad,* close to subdistant, white becoming dingy yellowish in age, edge entire. STEM 4-7 cm. long, 8-16 mm. thick, *stout,* equal, sometimes slightly tapering downward, *solid,* subglabrous, innately fibrillose-striate, white becoming dingy in age. SPORES minute, spherical, smooth, subnucleate, 5-6 micr., white. CYSTIDIA and *sterile cells* none. BASIDIA 35 x 5-6 micr. ODOR slight or lacking; TASTE at first slight, slowly *unpleasant or burning.*

Gregarious. On the ground, on a lawn which was recently a grove. Ann Arbor. October. Infrequent.

This species has superficial resemblances to *T. album,* both in stature and color, but differs in its slightly scaly cap and in spores. In moist weather the pileus appears watery-stained and this indicates an affinity to the section Guttata, but the presence of scales on the pileus and its rather dry flesh point to the position here

given it. It is easily confused with *T. venenata* when the spores are not examined, and hence should not be eaten. It is also likely that both *T. nobile* and *T. venenata* have been referred to *T. columbetta,* in the absence of available information on these plants, as both these species when young and fresh are rather white. The description of *T. serratifolium* Pk. very closely approximates this of *T. nobile.* It is entirely distinct from *Clitocybe piceina.*

727. Tricholoma columbetta Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 29.
Bresadola, Fungh. mang. e. vel., Pl. 23.
Gillet, Champignons de France, Pl. 671.
Cooke, Ill., Pl. 48.

"PILEUS 5-10 cm. broad, convex-plane, obtuse, dry, rigid, *pure white, satiny-shining,* at first glabrous, then silky-fibrillose or minutely scaly, *often with stain-like, carmine, yellow, or blue spots,* margin at first incurved and minutely tomentose. FLESH white. GILLS emarginate, almost free, close, rather broad, white, not changing color, edge uneven. STEM 5-9 cm. long, 1-1.5 cm. thick, equal or unequal, *not bulbous, solid, white,* shining, fibrillose-striate. SPORES 6-7 x 4-5 micr. ODOR none. TASTE mild."

In beech and birch woods, on the ground. The silky-shining and dry, white cap and stem, mild taste and elliptical spores distinguish this species from our other white plants of the genus. It must not be confused with *T. album* Fr. which has a bitter taste, nor with *T. nobile* which has a slight burning taste; both of these lack the pure white color of *T. columbetta.* The name refers to the satiny sheen of white pigeons. Several varieties, based on the different habit and various color-stains, have been described. It has not been found with certainty in the State; see remarks under *T. resplendens.*

**Gills becoming rufescent, cinereous or blackish.*

728. Tricholoma imbricatum Fr. (Edible)

Sys. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 53, p. 73, 1908.
N. Y. State Mus. Rep. 48, Pl. 21, Fig. 6-11, 1896.
Fries, Icones, Pl. 30.
Cooke, Ill., Plates 60 and 199.
Gillet, Champignons de France, No. 676.
Ricken, Blätterpilze, Pl. 90, Fig. 1.

PILEUS 5-8 cm. broad, convex-plane, obtuse or subumbonate, *dry,* brownish-red to pale reddish-umber, *innately fibrillose-scaly,* disk lacerate-scaly, margin thin, at first incurved and pubescent. FLESH compact, firm, white, *changing to light red when bruised.* GILLS slightly adnexed, sinuate, close, moderately broad, altogether white at first, changing to reddish in age or rufescent-spotted. STEM 5-9 cm. long, 1-1.5 cm. thick, *solid,* firm, equal or subequal, white, reddish-brown at base, *apex white-mealy,* elsewhere fibrillose. SPORES broadly elliptical, 5-6.5 x 4 micr. CYSTIDIA and *sterile cells* none. BASIDIA 24-28 x 5 micr., 2-4-spored. ODOR and TASTE mild or slightly farinaceous.

Gregarious or subcaespitose. On the ground in coniferous and mixed woods.

Frequent in the north. Rare in southern Michigan. Detroit. October.

It must not be confused with *T. transmutans,* which has a viscid cap, whose surface is bitter to the tongue. The stem is solid or hollowed by grubs. *T. vaccinum* Fr. differs mainly from this in the stuffed to hollow stem and the more scaly cap; it occurs also in conifer woods.

729. Tricholoma vaccinum Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 707.
Ricken, Blätterpilze, Pl. 90, Fig. 4.

PILEUS 4-7 cm. broad, subhemispherical to campanulate, then expanded, obtuse or subumbonate, dry, cinnamon-rufous to dark

reddish-brown, not striate, rimose in wet weather, *at first densely scaly,* becoming fibrillose-scaly, *margin at first involute and tomentose.* FLESH rather thin except disk, white at first, becoming tinted with rufous hues. GILLS subadnate then sinuate, moderately broad, broader than the thickness of the flesh, close, pallid then *rufescent in age* or when bruised. STEM 5-7 cm. long, 10-15 mm. thick, subequal, somewhat irregular, *hollow,* fibrillose or lacerated-fibrillose, fibrils reddish-brown, pallid elsewhere but rufescent. SPORES sphoeroid, 5 x 4 micr., smooth, white. TASTE somewhat disagreeable, subastringent. ODOR similar.

Gregarious-subcaespitose. On the ground under conifers. In the northern portion of the State. August-September.

The stuffed then hollow stem and the dense fibrillose scales of the reddish-brown cap distinguish it. The color of the cap in large specimens approaches umber, but the rufous shades are always present. The margin of the pileus is distinctly tomentose.

730. Tricholoma tricolor Pk.

N. Y. State Mus. Rep. 41, 1888.

"PILEUS 5-10 cm. broad, broadly convex or nearly plane, sometimes slightly depressed in the center, firm, dry, obscurely striate on the margin, *pale alutaceous, inclining to russet.* FLESH white. GILLS adnexed, thin, narrow, close, *pale yellow,* becoming brown or purplish-brown in drying. STEM stout, 5-7 cm. long, 1-2 cm. thick, short, firm, tapering upward from the thickened or subbulbous base, *white.* SPORES broadly elliptical or subglobose, 7 micr. long."

Reported by Longyear from Chatham in the north, and from Lansing. I have not found it. The peculiar hue of the dried gills is said to characterize it.

731. Tricholoma acre Pk. (Suspected)

Bull. Torr. Bot. Club, Vol. 24, 1897.

Illustration: Plate CXLVIII of this Report.

PILEUS 4-9 cm. broad, campanulate at first, then subexpanded, plane to obtuse, virgate, *dry, pale silvery-gray or mouse-gray with innate silky fibrils,* or fibrillose-scaly on disk, sometimes whitish,

even. FLESH rather thin, *firm*, white, at length tinged ashy. GILLS adnexed, emarginate, rather broad, ventricose, close, white, at length pale cinereous, edge minutely fimbriate. STEM 3-6 cm. long, 7-15 mm. thick, equal or subequal, sometimes subbulbous or tapering downward, short, *stuffed then hollow, white* or slightly cinereous, innately silky-fibrillose, shining, apex flocculose. SPORES broadly elliptical, 6-7 x 4-5 micr., smooth, with a clear cavity on one side. CYSTIDIA none; *sterile cells* on edge of gills, 30-35 x 9 micr., subclavate. ODOR none. TASTE *acrid*, sometimes tardily so.

Gregarious or subcaespitose. On the ground in frondose woods, especially oak and maple. Detroit, Ann Arbor, Jackson. September-November. Rather frequent.

The acrid Tricholoma is probably the American form of *T. murinaceum* Bull., in the sense of Berkeley and Gillet, but digers in the closer gills and glabrous, not scaly, stem. The figures of Cooke (Ill., Plate 49) and Gillet, (Champignons de France, No. 683), are very suggestive of our plant, except in the character of the stem. *T. murinaceum* in the sense of Fries has a disagreeable, strong odor, and was originally referred by him to Hygrophorus, now *H. nitratus* Fr. Gillet's figure of *T. portentosum* is a fairly good picture of some of our plants when the gills and stem are white. *T. acre* is quite variable in size and in the shade of gray of the cap. Normally the radiating fibrils of the pileus are pale gray or silvery-gray, but in luxuriant individuals are much darker gray or blackish, and in such examples the stem may be streaked with dark fibrils. Sometimes the cap is almost entirely white or buff and then silky or obscurely virgate, sometimes somewhat fibrillose-scaly on disk. The plant is closely related to *T. terreum*, from which it differs in its acrid taste, its firmer flesh, larger size, presence of cystidia and flocculose, edge of gills and broader spores.

732. Tricholoma terreum Fr. (Edible)

Epicrisis, 1836.

Illustrations: Hard, Mushrooms, Fig. 55, p. 76, 1908.
Swanton, Fungi, Pl. 8, Fig. 9.
Michael, Führer f. Pilzfreunde, Vol. II, No. 92.
Bresadola, Fungh. mang. e. vel., Pl. 24.
Patouillard, Tab. Analyt., No. 307.
Ricken, Blätterpilze, Pl. 92, Fig. 4.
Gillet, Champignons de France, No. 704.
Cooke, Ill., Pl. 50.
Peck, N. Y. State Mus. Mem. 4, Pl. 45, 1900 (as var. *fragrans*).
Plate CXLIX of this Report.

PILEUS 2.5-6 cm. broad, *thin,* convex-campanulate or nearly plane, dry, subumbonate, *gray,* grayish-brown or mouse-color, *innately fibrillose to fibrillose-floccose and at length scaly,* not striate. FLESH white, cinerascent or gray near surface of pileus, thin. GILLS adnate, then emarginate and uncinate, close but distinct, white, pale ashy or cinerascent, sometimes yellowish-stained, medium broad, edge entire. STEM 2.5-4 cm. long, 4-8 mm. thick, equal, straight or slightly curved, *solid or persistently fibrous-stuffed, readily splitting lengthwise,* white, whitish or cinerascent, subrigid, *fragile.* SPORES *minute, nucleate,* narrowly oblong-ovate, 5-6 x 3, smooth. CYSTIDIA *none, sterile cells* short or lacking. ODOR and TASTE *farinaceous,* especially when plant is crushed.

Gregarious or subcaespitose. On the ground in grassy places in frondose woods, thickets, etc. Ann Arbor, Detroit, New Richmond. August-November. Rather frequent about Ann Arbor.

After reading the descriptions and remarks of a dozen writers concerning this species and related ones such as *T. scalpturatum* Fr. and *T. squarrulosum* Bres., and adding one's own observations, it becomes clear that we have here a series of many forms which run so close into each other that the amateur will hardly be able to diagnose them satisfactorily in most cases. This fact is already recognized by the number of varieties which have been described both under *T. terreum* and *T. scalpturatum.* The above description applies to the plants which have been found in frondose woods of southern Michigan. Variations will be found in which the pileus is more densely scaly with almost blackish scales on center, and others where the color is pale silvery-gray. The color of flesh and

gills may remain almost white, or there may be an ashy tinge in all parts of the plant. Several characters seem to be constant in our plants, viz. the fragility, the nucleated narrow spores, and the fibrous nature of the interior of the stem. By these characters and the taste it is separable from *T. acre*. Authors give various shapes and sizes for the spores, which fact indicates that there are several independent species at present not separated. Bresadola has segregated a dark, scaly species whose spores measure 7-9 x 4-5 micr., as *T. squarrulosum*. *T. scalpturatum* (Fr.) Bres. has a well-developed but evanescent cortina at first; this approaches our form, and has the same spores, but lacks the distinct farinaceous odor. Our typical plants had no sterile cells on the edge of the gills. A form found at New Richmond had short cystidia and gills whose edges were minutely flocculose and spotted with drab-color, darker than the rest of the gills. Peck has named our form with the farinaceous odor var. *fragans*. The farinaceous odor seems to be the most common character of the American form of *T. terreum*.

733. Tricholoma fumescens Pk.

N. Y. State Rep. 31, 1879.

Illustration: Hard, Mushrooms, Fig. 54, p. 75.

PILEUS 2-6 cm. broad, convex-plane, regular at first, then undulate, obtuse, dry, *covered with a minute, appressed tomentum,* whitish to pale grayish-brown, darker where handled, even, margin at first incurved. FLESH rather thin. GILLS rounded behind at first, then acuminate adnexed, narrow, *very crowded,* whitish, *changing to bluish-black in age or when bruised,* easily separable from trama of pileus. STEM 2-6 cm. long, 5-10 mm. thick, short, rather stout, *whitish then brownish,* solid, becoming cavernous and splitting, pruinose at apex. SPORES narrow, subfusiform-elliptical, 5-6.5 x 3 micr.; *sterigmata* prominent, 3-4 micr. long. ODOR and TASTE slightly farinaceous.

Gregarious or subcaespitose. On the ground, in low, frondose woods. Jackson, Ann Arbor. September-October. Infrequent.

Recognizable by the narrow, crowded gills, which become bluish-black in fresh specimens if bruised; in age or when dried they are almost as black as old gills of *Agaricus campestris*. The pileus and stem do not change as much, inclining to brownish, and in this differ markedly from *T. fuligineum*. The latter also possesses

subdistant and broader gills. Our plant is not frequent, having been collected only thrice. The separable gills ally it to those species which W. G. Smith placed under the genus Lepista.

734. Tricholoma fuligineum Pk.

N. Y. State Rep. 41, 1888.

Illustration: Plate CXLIX of this Report.

PILEUS 3-7 cm. broad, convex, then expanded-subdepressed, or obtuse, often irregular, sometimes with sinus on one side, *sooty-brown to dark grayish-brown,* becoming blackish on handling, dry, minutely innately scaly or fibrillose, even. FLESH white at first, cinerascent, scissile. GILLS adnate or adnexed, then emarginate, *subarid,* very tough when dry, *close to subdistant,* moderately broad, whitish or cinereous, *becoming black when bruised.* STEM 3-6 cm. long, 6-10 mm. thick, short, rarely elongated, solid or spongy-stuffed, equal or subequal, innately fibrillose, pruinose at apex, whitish or cinereous, *blackish when handled.* SPORES narrow, elliptical-fusiform, 7-9 x 4-5 micr., smooth, white. CYSTIDIA and *sterile cells* lacking. BASIDIA about 30 x 6-7 micr. ODOR and TASTE more or less farinaceous.

Gregarious or caespitose. On the ground among mosses, leaves, etc., frondose woods of oak and maple. Jackson, Detroit, Ann Arbor. September-October. Infrequent.

Somewhat variable in size and shape, etc., under different conditions of weather and situation. It differs from *T. fumescens* in that the entire plant becomes sooty when dried, and it has larger spores and gills. The gills often assume a reddish hue when bruised, then become black, as in *Russula nigricans.* The stem is sometimes slightly floccose at first, as if frosted, and occasionally becomes cavernous. Small forms of *T. cinerascens* have a more watery pileus and the gills do not turn sooty-black. Dr. O. E. Fisher reports that it has appeared abundantly in his back yard on discarded mushroom beds.

Section II. Rigida. Pellicle of the pileus rigid, with a tendency to crack into small smooth scales, sometimes punctate-granulose; neither viscid, floccose-scaly nor fibrillose. Flesh of pileus rigid, somewhat cartilaginous.

**Gills not becoming reddish nor cinereous, nor yellow-stained.*

735. Tricholoma saponaceum Fr. (Unpalatable)

Epicrisis, 1836.

Illustrations: Hard, Mushrooms, Fig. 56, p. 77, 1908.
Michael, Führer f. Pilzfreunde, Vol. II, No. 90.
Ricken, Blätterpilze, Pl. 93, Fig. 1.
Cooke, Ill., Plates 91 and 216.
Gillet, Champignons de France, No. 698.
Fries, Icones, Pl. 32.

PILEUS 4-8 cm. broad, convex-expanded, firm, glabrous or becoming cracked to form small scales, not virgate, pale *livid-brown to lead-gray* but variable in color, often olive tinged, margin at first naked and incurved. FLESH white, *becoming pinkish,* thick, firm. GILLS adnato-emarginate then uncinate, subdistant, *distinct,* rather broad, *whitish, not cinerascent,* edge entire. STEM 5-8 cm. long, 1.5-2 cm. thick, rather stout, *ventricose, attenuated or subradicating below,* solid, fibrous-fleshy, apex flocculose, *becoming pink within,* white without, glabrous varying to floccose or minutely dark-scaly. SPORES minute, elliptical-ovate, smooth, 5 x 3-3.5 micr. ODOR and TASTE strongly oily-farinaceous (soapy), distasteful.

Solitary or gregarious. In frondose woods, on the ground. September-October. Ann Arbor, New Richmond, Detroit. Infrequent.

The colors of the pileus vary and are difficult to describe, sometimes varying from whitish to grayish-brown or smoky-brown. The gills are said to become greenish or rufescent at times. The odor, color of the flesh and minute spores distinguish it. Where bruised the flesh of the stem retains the pink tinge in a persistent manner, and this character is quite marked. It is unfit for food on account of its taste. The odor and taste are sometimes very slight. *T. pallidum* Pk. is probably a variation of this species.

***Gills becoming stained or changing to ashy or reddish in age.*

736. Tricholoma laticeps sp. nov.

Illustration: Plate CL of this Report.

PILEUS 3-10 cm. broad, *rigid,* broadly convex, obtuse, *smoky-umber to blackish,* moist, even, *glabrous, or punctate-granulose on disk,* margin at first strongly decurved, then spreading naked. FLESH firm, brittle, *thick,* thinner at margin, *cinerascent, scissile.* GILLS broadly adnexed, emarginate, close to subdistant, *broad,* white, at last cinereous, edge sometimes eroded. STEM *short,* rigid, spongy-solid, 1-3 cm. long, 7-16 mm. thick, equal or subequal, white or pallid, cinerascent within, innately silky. SPORES short and broadly elliptical to subglobose, smooth, 6-7 x 5-6 micr., white. BASIDIA 30 x 6-7 micr. CYSTIDIA and *sterile cells* none. ODOR and TASTE mild.

Gregarious to caespitose. On the bare ground or among mosses or in grassy places, in conifer or frondose woods or groves. Ann Arbor, Detroit, New Richmond. September-November. Infrequent.

Distinguished by its very short stem and relatively broad pileus which hugs the ground so as to hide the stem. The pileus is often broader in one diameter. It seems to be related to *Tricholoma cartilagineum,* but the gills are broad and subdistant in well-developed specimens, and the pellicle is rarely granular-punctate and then only on the disk. The pellicle is rather adnate and composed of long, narrow, horizontal cells. It cannot be referred to *T. lugubre* Pk. since that species is described as having narrow and close gills; nor to *T. tumidum* Fr. whose stem is longer, and whose gills have a rufescent tinge. The scissile flesh indicates a hygrophanous condition, but this is not marked. Its edibility was not tested.

Section III. Sericella. Pileus without a distinct pellicle, silky or glabrous, very dry; neither moist, viscid, hygrophanous, nor distinctly scaly. Pileus opaque, rather thin.

737. Tricholoma sulphureum Fr. (Unpalatable)

Syst. Myc., 1821. (As Clitocybe.)

Illustrations: Cooke, Ill., Pl. 62.
Gillet, Champignons de France, No. 703.
Bresadola, Fungh. mang. e. vel., Pl. 27.
Patouillard, Tab. Analyt., No. 507.
Berkeley, Outlines, Pl. 4, Fig. 4.
Swanton, Fungi, Pl. 44, Fig. 1.
Hard, Mushrooms, Fig. 46, p. 65.

PILEUS 2-8 cm. broad, convex-expanded, mostly *umbonate,* at first silky, soon glabrous, *sulphur-yellow to olivaceous-yellow,* usually tinged brown on disk, subgibbous, even, margin decurved. FLESH yellow or yellowish, thick on disk. GILLS adnexed with tooth, emarginate at length, *subdistant, yellow,* moderately broad, thick, firm. STEM 4-8 cm. long, 5-10 mm. thick, equal or variously enlarged, sometimes curved, fleshy-fibrous, innately fibrillose, stuffed, sometimes compressed, yellow to olivaceous-yellow, yellowish within. SPORES elliptical-oval, 8-10 x 5-6 micr., smooth. ODOR strong, foetid or of coal-tar; TASTE disagreeable.

Gregarious. On the ground in frondose woods of maple, birch, oak, etc. Houghton, Ann Arbor. July-September. Infrequent.

Our plant is well illustrated by Cooke, but it is usually a less deep yellow, and often tinged with olive or reddish-brown on the cap. It is well marked by the disagreeable, coal-tar odor and taste, by the subdistant gills and by the spores. Bresadola (Funghi mang. et. vel.) gives the spores as warty; this cannot be our plant. In Stevenson the spores are given too small, being nearer those of *T. sulphurescens* Bres., which also has the odor and color of *T. sulphurcum* but whose gills are said to be crowded and whitish. Unler a lens the dry pileus is often seen with micaceous-shining spots. It differs from *T. chrysenteroides* Pk. in its disagreeable odor, subdistant gills and stuffed to hollow stem.

738. Tricholoma chrysenteroides Pk.

N. Y. Mus. Rep. 24, 1872.

"PILEUS 2.5-5 cm. broad, convex or plane, *not umbonate,* firm, dry, slightly silky or glabrous, *pale yellow or buff,* becoming dingy

with age. FLESH pale yellow. GILLS *close*, emarginate, yellowish, dingy or pallid in age, marked with transverse veinlets along the upper edge, intervenose. STEM 5-7 cm. long, 6-8 mm. thick, firm, equal, *solid,* glabrous, fibrillose-striate, yellowish within and without. SPORES elliptical, 7-10 x 5-6 micr. ODOR and TASTE *farinaceous."*

Gregarious. On the ground in woods.

This species has not with certainty been collected within the State. The description is adopted from Peck, and included for the sake of comparison.

739. Tricholoma odorum Pk.

Torrey Bot. Club. Bull., Vol. 25, 1898.

PILEUS 2-5 cm. broad, convex-expanded, obtuse, glabrous, "soft like kid," shining when young, *waxy-yellow to pale tan,* even. FLESH thick, concolor. GILLS adnexed, emarginate, *rather broad,* subdistant, thick, *whitish, tinged flesh-pink,* edge entire. STEM 3-7 cm. long, 4-10 mm. thick, equal or subbulbous, *stuffed then hollow,* subflexuous, silky-fibrillose, yellowish white, darker yellow at base and within, pruinose at apex. SPORES broadly elliptic-ovate, smooth, 7-9 x 5-6 micr., variable, white. CYSTIDIA and *sterile cells* none. ODOR rather strong, reminding one of that of *T. sulfureum;* TASTE farinaceous.

Gregarious. On the ground in beech and pine woods. New Richmond. September. Rare.

This seems to approach *T. sulfureum* and is probably a variation of it. Further data are necessary to establish it fully. The incarnate tinge to the whitish gills, and the peculiar odor are characters which distinguish it.

740. Tricholoma carneum Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 40, Fig. 3.
Cooke, Ill., Pl. 96.
Patouillard, Tab. Analyt., No. 614.

PILEUS 1.5-2 cm. broad, convex-plane, obtuse, sometimes umbonate, even, glabrous or *subpruinose,* testaceous when young, then

flesh color to whitish tan, margin thin and at length spreading or recurved. FLESH thickish on disk, white, soft, rather fragile. GILLS sinuate-adnexed, uncinate, at length subdecurrent, *crowded,* rather narrow, *pure white,* edge mostly even. STEM 1.5-2.5 cm. long, 2-3 mm. thick, equal, *fibrous,* hollow, sometimes compressed, *tinged flesh color*, pruinose above, subtomentose below. SPORES minute, oblong, 4-5 x 2.5 micr., smooth, white. ODOR and TASTE none or subfarinaceous.

Gregarious or subcaespitose. On the ground among leaves and debris in frondose woods. Ann Arbor. August-September. Infrequent.

This small species of Tricholoma is well-marked by the incarnate color of cap and stem which contrasts with the pure white of the gills. Fries has described a species near it, *T. paeonium,* which is said to differ in the "ruber"-red color of cap which does not fade as in our plants; the latter species also has a softer stem than ours.

SUBGENUS III. MELANOLEUCA. Pileus glabrous, either watery-spotted, moist or hygrophanous; not viscid (except when very water-soaked), nor silky, scaly nor granular. FLESH soft, spongy, or very thin, moist, watery or hygrophanous.

Section I. Guttata. Pileus fleshy, fragile, watery-spotted or rivulose. Usually caespitose.

741. Tricholoma unifactum Pk. var.

N. Y. State Mus., Bull. 105, 1906.

Illustration: Ibid.

PILEUS 3-8 cm. broad, *convex,* dull white *mottled with watery spots,* subpruinose, even, creamy-buff in age. FLESH thick on disk, thin elsewhere, white, fragile. GILLS adnexed, becoming emarginate, narrow, narrowed anteriorly, crowded, whitish, edge entire. STEM 5-10 cm. long, prolonged by insertion into a crack in the log, 8-15 mm. broad, equal or tapering upward, curved, solid, even, floccose-pruinose, tomentose at base. SPORES subglobose, minute, 3-4.5 x 3.5 micr., smooth, white. CYSTIDIA and *sterile cells* none. ODOR and TASTE slight.

Caespitose. On decayed charred log, probably hemlock, in mixed woods of ravines. New Richmond. September. Rare.

The plants from which Peck derived his description grew on the ground under hemlock trees and in that situation formed a thick fleshy mass from which the stems arose. Although our plants were caespitosely united only at the base, and grew from a woody substratum, I have scarcely any doubt that they are the same. When dried, the cap, gills and base of stem are ochraceous. In some ways it approaches *Pleurotus elongatipes* Pk. but the stem is solid and scarcely eccentric, and the pileus is spotted with watery marks. *T. conglobatus* Fr. (Eddelbuttel, Ann. Mycol., Vol. 9, p. 512) differs in its brownish-gray pileus and spores 6-7 x 5 micr., although Schroeter (Die Pilze Schlesiens, p. 660) says the cap of that species is often whitish. Our plants are very close to *T. boreale* Fr., whose spores, according to Massee (European fungus Flora) are the same, but whose pileus is at first bright flesh color, then fades to whitish.

Section II. Spongiosa. Pileus fleshy, compact, becoming spongy, obtuse, even, glabrous, moist. Neither hygrophanous nor viscid. (Water soaked specimens sometimes become subgelatinous; the pileus in all cases absorbs water in wet weather.)

742. Tricholoma album Fr. (Sense of Fries) (Unpalatable)

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 43.
Cooke, Ill., Pl. 65.
Berkeley, Outlines, Pl. 4, Fig. 6.
Patouillard, Tab. Analyt., No. 615.

"PILEUS 6-10 cm. broad, convex then plane and depressed, not umbonate, *glabrous,* dry, even, margin at first involute at length repand, *sometimes entirely white, sometimes yellowish especially on the disk.* FLESH tough, moderately thick, but not compact. GILLS more or less emarginate, close, up to 8 mm. broad, white, unchanging. STEM 6-10 cm. long, 8-12 mm. thick, attenuated upwards, *solid, elastic,* externally fibrous, glabrous, obsoletely pruinose at apex under lens, concolor. ODOR none; TASTE acrid, unpleasant." SPORES (Massee, Stevenson, Winter) elliptical, 5-6 x 2.5-3; (Romell) 6-7 x 4-4½; (Ricken) lanceolate, 7-8 x 3-3.5 micr.

This species has not yet been found with certainty in the State. The description is adopted from that of Fries in Icones *T. venenata* Atk. and *T. nobile* Pk. approach it by their external characters, but if the spore-measurements given by the English authors actually belong to this species, then *T. nobile* is quite distinct by its spherical spores, and *T. venenata* by its larger spores. It is easy to confuse *T. album* with *T. panoeolum* in some of its forms when young and white, but later the changing gills of the latter species mark it sufficiently. The pileus is said to be entirely glabrous, and this also separates *T. album* from *T. venenata* and *T. nobile*. The taste is given by Fries as "acrid" in Icones, and "bitter" in Hymen. Europ. In Lindblad's Svampbok the pileus is said to become sordid-stained an hour after being bruised, the odor is said to be strongly radishy; and the plant is said to have a sharp burning taste after being chewed awhile. Some authors consider it *poisonous*, and it is evidently not edible, and must be regarded close to *T. venenata* in this respect. It appears that this species needs further study, and it is desirable that continental authors give us exact data concerning the spores of their plants.

743. Tricholoma acerbum Fr. (Unpalatable)

Syst. Mycol., 1821.

Illustrations: Gillet, Champignons de France, No. 662.
Plate CLI of this Report.

PILEUS 7-10 cm. broad, firm, convex-expanded, *obtuse*, dry, subpruinose, soft to the touch, *dull buff to yellowish-white, or whitish with a flesh color tinge*, margin at first inrolled and *obscurely ridged*. FLESH white, thick on disk, thin on margin. GILLS emarginate with decurrent tooth, *narrow, crowded*, whitish becoming creamy-white or slightly rufescent, edge entire. STEM 4-6 cm. long, 1-2 cm. at apex, 2-2.5 cm. below, sometimes abruptly short-rooting, *solid*, firm, at first bulbous then *tapering upward*, at first covered by a thin satiny tomentum or pruinosity, becoming fibrillose, whitish becoming dingy where handled. SPORES minute, spherical, nucleate, 4-5 micr., white. CYSTIDIA none. BASIDIA about 30 x 5-6 micr. TASTE *very bitter;* ODOR scarcely agreeable, somewhat aromatic-farinaceous.

Gregarious to subcaespitose. On the ground in frondose woods. Ann Arbor, Detroit, New Richmond, Bay View. June-October (earliest record, June 11). Frequent.

The bitter taste and changing gills and stem distinguish *T. acerbum* from *T. laterarium* Pk. with which it is easily confused. Both species are marked by the narrow, crowded gills, spherical spores, the whitish to pale yellowish-tan cap, and the slight ridges which are found on the margin of the cap. The gills are sometimes spuriously decurrent, when it might be confused with small forms of *Clitocybe candida,* but the latter has a mild taste and its pileus becomes concave. Superficially it approaches *T. panoeolum* var. *caespitosum* also. Bresadola (Fungh. mang.) assigns to it obovate spores, measuring 6-7 x 3-3.5 micr., while others give them globose.

744. Tricholoma laterarium Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874 (Buffalo Soc. Nat. Hist., 1873).

Illustration: Hard, Mushrooms, Fig. 47, p. 66, 1908.

"PILEUS 5-10 cm. broad, convex-expanded, sometimes slightly depressed in center, pruinose, whitish, *disk often tinged with brick-red or brown,* the thin margin marked with slight, subdistant, short, radiating ridges. FLESH white. GILLS emarginate, decurrent in slight lines, *narrow, crowded, white.* STEM 5-7 cm. long, nearly equal, solid, white. SPORES globose, 4-5 micr. diameter."

Gregarious. On the ground in conifer woods. Probably in the northern part of the State.

I have no notes on this species, hence have given Peck's description. No data are at hand as to its taste and odor. It is close to *T. acerbum,* apparently only distinguishable by its mild taste and white gills, and may prove to be identical with that species.

745. Tricholoma leucocephalum Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 43.
Cooke, Ill., Pl. 78.

PILEUS 3-6 cm. broad, *thin,* convex then plane, obtuse, even, moist, glabrous, the slight silkiness disappearing, *white.* FLESH compact, *white, watery in wet weather.* GILLS rounded behind, *free,* thin, crowded, *pure white,* edge very entire. STEM 5-7 cm. long, 4-8 mm. thick, subcartilaginous to fibrous, *hollow, solid at the narrowed, rooting base, glabrous,* white. SPORES 6-8 x 3-4 micr.

(perhaps longer when fully mature), elliptic-ovate, apiculate. ODOR and TASTE distinctly *farinaceous.*

Gregarious. On the ground in conifer woods. Marquette. September. Rare.

The description is adapted from the Icones of Fries. The figures cited represent a plant like that of form (B) of *T. resplendens* (which see), whose stem was minutely hollow, but whose cap was distinctly viscid. *T. leucocephalum* has been found but once, and is apparently rare. It has been confused, according to Fries, with *T. columbetta* and *T. album;* "the former is mild and edible, the latter bitter and very poisonous, while *T. leucocephalum* has a strong odor of fresh meal."

746. Tricholoma fumosiluteum Pk.

N. Y. State Mus. Rep. 27, 1875.

"PILEUS 3-7 cm. broad, convex-expanded, *moist, glabrous,* smoky-*yellow*. FLESH white or yellowish under the subseparable cuticle. GILLS rounded behind, deeply emarginate at length, *broad,* close, white. STEM 6-10 cm. long, *rather elongated,* 6-10 mm. thick, glabrous, *hollow,* white. SPORES globose, 4.5-6 micr. diameter. ODOR and TASTE farinaceous when flesh is crushed."

Gregarious to subcaespitose. On the ground in frondose woods. Ann Arbor. October. Rare.

The description is adapted from that of Peck. "The disk of the pileus is often darker, and sometimes spotted." My specimens show a tendency for the stem to become elongated relative to the width of the pileus.

747. Tricholoma personatum Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 87 and 88, 1900.
Murrill, Mycologia, Vol. 2, Pl. 19, Fig. 1.
Hard, Mushrooms, Fig. 61 and 62, p. 84, 1908.
Marshall, Mushroom Book, Pl. 21, p. 72, 1905.
Ricken, Blätterpilze, Pl. 95, Fig. 3.
Michael, Führer f. Pilzfreunde, Vol. II, No. 89 (as *T. bicolor*), and Vol. III, No. 113.
Peck, N. Y. Mus. Rep. 48, Pl. 22, 1896.
See also Cooke, Gillet, Berkeley, etc.

PILEUS 5-12 cm. broad, convex-expanded to plane, obtuse, glabrous, moist or water-soaked, *variable in color,* grayish to brownish, *tinged with lilac, lavender or purplish hues,* fading in age to pale livid or sordid-white, even, *margin at first involute and villose-pruinose,* at length spreading, naked and undulate. FLESH lavender-tinged when fresh, fading to whitish, often water-soaked in wet weather. GILLS slightly truncate-adnate to almost free, rather broad, crowded, *at first blue, then lavender, grayish-rufescent, etc.,* separable from pileus, edge entire. STEM 3-7 cm. long, 1-2 cm. thick, rather short, stout, at first bulbous, becoming clavate or tapering upwards or sometimes equal, *solid, at first blue then persistently lavender or lilac,* sometimes fading to pale livid, etc., *frosted by minute, furfuraceous-squamules,* glabrescent, pale grayish within. SPORES narrowly elliptical, smooth, non-nucleate, 7-8 x 4-5 micr. (rarely longer), *pale flesh color in mass.* CYSTIDIA and *sterile cells* none. BASIDIA 28-30 x 6-7 micr., 2-4-spored. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground among decaying leaves or brush piles, in mixed or frondose, open or thin woods. Throughout the State. September-November. (Earliest record August 25.) Common.

This is a favorite for the table. It is easily known among the large Tricholomas by its bluish or lavender colors when fresh, and in this respect imitates some of the Cortinarii, but such confusion will not lead to trouble, as the latter are equally safe. *Cortinarius michiganensis* and *Cortinarius albatus* have similar colors, but are distinguished by the cortina when young, and the darker gills when old. It is not easily confused with *Cortinarius violaceous,* as some have stated, since that species is long-stemmed, has a much darker color and the cap is minutely scaly. *T. nudum* is a more slender plant, and differs mainly in its deeper blue or purplish colors on cap and stem, and the naked margin when young. All are edible. Our plant loves to grow among heavy masses of fallen or decaying leaves which often completely hide it in the late autumn. It varies in color, so that several varieties have been named; these varieties are mostly the result of weather conditions, of habitat or of late growth. After having been soaked by rains it is less palatable. The color of the spores shows it to be intermediate between Tricholoma and Entoloma, and induced W. G. Smith and others to call it *Lepista personata.*

748. Tricholoma nudum Fr. (Edible)

Syst. Myc., 1821.

Illustrations: N. Y. State Mus. Bull. 116, Pl. 104, Fig. 1-9, 1907.
Cooke, Ill., Pl. 67 (too faded).
Gillet, Champignons de France, No. 685.
Bresadola, I. Funghi mang. e. vel., Pl. 30.
Ricken, Blätterpilze, Pl. 95, Fig. 4.

PILEUS *3-8 cm. broad, thin,* convex-expanded to plane, obtuse, sometimes depressed, glabrous, even, soft to the touch, moist, *purplish-violaceous to lavender,* fading to pale violaceous-brown or dingy rose-color, *margin at first incurved and naked.* FLESH tinged violet, at length whitish, thin, rather firm. GILLS truncate-adnate then subdecurrent and slightly sinuate, crowded, narrow, violaceous at first. STEM 3-7 cm. long, 4-10 mm. thick, *slender or moderately stout,* solid, equal or slightly enlarged at base, silky-pruinose, glabrescent, purplish-violaceous then grayish-brown. SPORES 6-7 x 4-5 micr., elliptical, sordid flesh color in mass. ODOR and TASTE mild or slightly acid.

Gregarious or subcaespitose. On the ground in woods. Ann Arbor. September.

This is intermediate in size between *T. personatum* and *T. ionides,* and all three have similar colors. *T. ionides,* which has been reported from the state by Longyear, is known by its conic-campanulate pileus, which is at first flocculose on the margin, its stuffed to hollow stem, and whitish gills and spores; its cap is 2-5 cm. broad. Huyot (Soc. Myc. de France, Vol. 16, p. 95) states that it can always be distinguished, since the flesh of the stem is uniformly *blue,* while that of *T. personatum* is pallid or grayish. Peck says the stem of his plants was stuffed or hollow, while European authors describe it as solid. The spores, as in *T. personatum,* are pale flesh color, and show the relation of these plants to the rosy-spored group; but as it is now pretty well admitted that the sum of the other characters of a plant are of more generic importance than the spore-color, especially where it is not very marked, it would seem best to keep them in this genus.

749. Tricholoma tumidum Fr.

Syst. Mycol., 1821.

Illustrations: Cooke, Ill., Pl. 93.
Michael, Führer f. Pilzfreunde, Vol. III, No. 111.
Plate CLII of this Report.

PILEUS 6-10 cm. broad, firm, convex-expanded, then plane or broadly depressed, *moist,* regular at length wavy, glabrous, sometimes watery-spotted, clouded with *gray to brownish-gray especially on disk,* whitish on margin, even, margin thin and *at first tomentulose.* FLESH white, slightly and slowly cinerascent, thin on margin, rather brittle. GILLS adnexed, then deeply sinuate, *broad, subdistant,* ventricose, at first shining white then slightly cinerascent, brittle, scarcely intervenose, edge entire. STEM 5-7 cm. long, 1.5-2 cm. thick, *stout, solid,* compact spongy within, subequal or subbulbous, sometimes abruptly subradicating, *glabrous,* slightly scurfy at apex, white then slightly cinerascent. SPORES minute, subfusiform-elliptic, smooth, 5-6 x 3 micr., white. CYSTIDIA and *sterile cells* none. ODOR and TASTE mild.

Scattered or singly. On the ground among fallen leaves, etc., in frondose woods. October. Ann Arbor. Infrequent.

A rather noble plant when fresh, rather firm at first, becoming brittle. It was placed by Fries in section Rigida, but is placed here because of its similarity to *T. cinerascens.* The pileus has a slightly raised circular ridge a short distance from the margin as indicated in Cooke's figure. In some individuals the pileus was marked by watery spots toward the margin (like those on the stem of *Lactarius scrobiculatus*) and sometimes it was slightly ochraceous-stained. The thin margin at length becomes subplicate-crenate. The stems are not ventricose nor is the cap as dark, but otherwise it seems to have all the marks of the species figured by Cooke and Michael. It differs from *T. cinerascens* which it approaches closely in color, by its more rigid habit and by its subdistant gills which do not separate easily from the trama of the pileus.

750. Tricholoma cinerascens Fr. (Edible)

Monographia, 1863.

Illustration: Ibid, Pl. 153.
Ricken, Blätterpilze, Pl. 97, Fig. 2.
Plate CLIII of this Report.

PILEUS 5-10 cm. broad, convex then expanded, obtuse, obscurely floccose-tomentose or glabrous, *white or buff, then gray,* sub-unicolorous, *moist,* even, margin thin, naked. FLESH white, thick on disk. GILLS adnexed, slightly emarginate, *close, medium broad,* dingy white, becoming yellowish, *easily separable from pileus,* edge entire. STEM 5-7 cm. long, 1-1.5 cm. thick, equal, except spongy-thickened base, which is often mycelioid-tomentose, *spongy-stuffed to hollow,* sometimes curved, white, then cinerascent, subglabrous, pruinose at apex. SPORES minute, elliptical, 5 x 3 micr. (rarely longer). TASTE when crushed, farinaceous. ODOR subfarinaceous.

Gregarious to caespitose. On the ground among decaying leaves in frondose woods. October. Ann Arbor. Infrequent.

The pileus is more spongy and less firm than in *T. tumidum,* the gills are close and become more or less dingy yellowish. The pileus feels glabrous, although there is an innate floccosity to it. The gills separate from the trama of the pileus as in the genera Lepista, Paxillus and Gomphidius, etc. It belies its name, since the fresh plant may become only slightly cinereous.

751. Tricholoma panoeolum var. caespitosum Bres.

Fungi Trid., Vol. 2, 1892.

Illustration: Ibid, Pl. 153.

PILEUS 5-12 cm. (sometimes up to 20 cm.) broad, convex-expanded, then irregular or sinuate-lobed, sometimes eccentric, *whitish, buff, grayish-brown or dingy tan,* sometimes *shining white,* glabrous or obscurely flocculose on disk, *cuticle subcartilaginous, margin persistently incurved.* FLESH rather firm, very moist in wet weather or water-soaked and then fragile. GILLS *very crowded, narrow, easily separable from the pileus, varying subdecurrent or truncate adnate or slightly sinuate,* white at first, *soon dingy-flesh color.* STEM 3-8 cm. long, 8-15 mm. thick, subequal, solid or spongy within, at first covered with white frostiness, then fibrillose,

apex scurfy, pallid-whitish. SPORES elliptic-ovate, minute, smooth, 5-6 x 3-3.5 micr., whitish or pale dingy flesh color in mass. ODOR slight or of rancid meal. TASTE slowly peppery or disagreeable, remaining in the mouth a long time.

Caespitose, rarely solitary. On the ground in frondose or conifer woods. Ann Arbor, Detroit, Bay View, Marquette and New Richmond. September-November. Frequent.

This is one of the most difficult species of Agarics to place properly. Its gills which are often subdecurrent tend to throw it into the genus Clitocybe; and the ease with which they separate from the trama of the pileus is characteristic of the genus Paxillus. The attachment of the gills varies furthermore, sometimes becoming sinuate, sometimes not at all decurrent. In other respects the gills form the very best means of recognizing this species, as indicated in the description. The plants also vary in size and color; clusters composed of several very large specimens are sometimes found, which simulate *Clitocybe gigantea* and *Clitocybe candida*, but differ from both in that the gills become flesh color, and in the tardily peppery taste. After being exposed to rains, the plants become water-soaked, take on a flesh-tint throughout and are quite fragile. It is probable that *T. rancidulum* Banning is the same plant.

Section III. Hygrophana. Pileus thin, hygrophanous. Flesh at first compact, then soft, moist and hygrophanous.

The color of the pileus changes as the moisture escapes, usually becoming much paler. Patouillard (Les Hymenomycetes d'Europe, p. 36, 1887) has separated certain species, e. g., *T. melaleuca*, from this section on the basis of their echinulate spores, spongy consistency and grayish or blackish tinge, and erected the genus Melaleuca for them. Fayod (Ann. d. Sci. Nat., 7 ser., vol. 9, p. 348) did the same, including *T. brevipes, T. nudum, T. grammopodium, T. personatum* and *T. sordidum* in that genus, and using mainly the irregular hyphae of the gill-trama as the separation character. It has seemed best however, to keep the Friesian arrangement of this section until the data are more complete. Only a few species of this section have so far been identified.

752. Tricholoma melaleucum Fr.

Syst. Mycol., 1821.

Illustrations: Fries, Icones, Pl. 44.
Ricken, Blätterpilze, Pl. 96, Fig. 5.
Gillet, Champignons de France, No. 682.
Cooke, Ill., Pl. 119.
Hard, Mushrooms, Fig. 50, p. 69, 1908.
Michael, Führer f. Pilzfreunde, Vol. III, No. 112.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 4.

PILEUS 3-7 cm. broad, thin, *convex-plane,* regular or wavy, obscurely umbonate, glabrous, moist, hygrophanous with a somewhat separable cuticle, *smoky-brown or fuliginous (moist)*, ochraceous-tan, buff or paler (dry), umbo darker. FLESH scissile, grayish, or grayish-white. GILLS adnexed, emarginate, narrow to moderately broad, subventricose, rather close, thickish, pure white at first becoming dingy. STEM 3-8 cm. long, 3-6 mm. thick, *strict,* elastic, equal or thickened at base, whitish, *streaked with smoky fibrils,* persistently stuffed. SPORES 6-8 x 4-5 micr., minutely rough, elliptical-oval, white.

Scattered or growing singly. On the ground or among grass in cultivated fields, gardens, lawns, etc., rarely in woods. Spring and autumn, June, September-October. Ann Arbor, New Richmond, Marquette. Frequent.

This is usually an open ground Tricholoma. The somewhat rigid, subcartilaginous stem reminds one more of Collybia than of Tricholoma. The pileus is sometimes quite blackish and the stem streaked with black fibrils. It was formerly (Mich. Acad. Sci.) referred to *Collybia stridula* because of the spores. The measurements given by Massee for *T. melaleucum* are 10 x 4-5 micr. Schroeter and Ricken, however, find spore measurements the same as in our plants, and hence, as it agrees well otherwise, it is referred to *T. melaleuca.* The gills vary from linear to subventricose. The stem is sometimes smoky, covered with white fibrils.

753. Tricholoma leucocephaloides Pk.

N. Y. State Mus. Rep. 49, 1896.

PILEUS 3-6 cm. broad, convex, obtuse, undulate or irregular,

hygrophanous, brown or grayish-brown (moist), whitish or whitish-tan (dry), subviscid in wet weather, even. FLESH becoming white, thin. GILLS adnate to subdecurrent, slightly emarginate, close to subdistant, moderately broad, whitish. STEM 3-6 cm. long, 5-8 mm. thick, equal, curved, spongy-stuffed, apex floccose, elsewhere glabrescent, whitish (dry). SPORES minute, elliptical, smooth, 5-6 x 3-4 micr. ODOR and TASTE *strongly farinaceous.*

Gregarious. On the ground, frondose woods. Ann Arbor. October. Rare.

754. Tricholoma sordidum Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 45.
Cooke, Ill., Pl. 100.
Hard, Mushrooms, Fig. 44, p. 63, 1908.
Ricken, Blätterpilze, Pl. 95, Fig. 5.

PILEUS 2-6 cm. broad, convex then expanded and depressed, with or without an obscure umbo, hygrophanous, *flesh color* to *avellanus* (Ridg.) when young, wood-brown in age, fading, glabrous, even or substriatulate on the naked and incurved margin. FLESH thin, except disk, toughish, drab color when young or moist, pallid in age. GILLS adnate, at length emarginate-sinuate, *vinaceous-drab* to subviolaceous, close, thin, moderately broad, edge entire. STEM *short,* 2-4 cm. long, 4-8 mm. thick, equal, solid, toughish-fibrous, *fibrillose,* naked at apex, whitish or sordid, curved, base mycelioid or subrooting. SPORES elliptic-oblong, 6-7.5 x 3-4 micr., smooth, white. *Trama of gills* parallel. CYSTIDIA none. BASIDIA clavate, 30-32 x 4-5 micr. ODOR and TASTE mild.

Caespitose or gregarious-subcaespitose. On decaying vegetable matter, straw-heaps, etc., in fields and gardens. August-October. Ann Arbor. Infrequent.

Known by the caespitose habit, by the dingy flesh-colored or subviolaceous pileus and gills and by the place of growth. Usually it appears only after abundant rains. The stem is said to be sometimes eccentric. It must not be confused with *T. nudum.*

Clitocybe Fr.

(From the Greek, *clitos,* sloping, and *cybe,* head.)

White-spored; stem *spongy-fleshy to fibrous*, elastic, its fibers continuous with the trama of pileus, hence not separable. Gills *decurrent* or acutely adnate, often separable from the pileus, *not emarginate* nor sinuate, margin of pileus at first involute. No annulus.

Fleshy, firm or soft mushrooms, growing mostly on the ground or decaying leaves, sometimes on wood, in fields, road-sides or forest. Mostly medium to large size.

The PILEUS is mostly glabrous or silky fibrillose, scaly in a few species, sometimes with rather thick flesh, often quite thin and flexible. Many are hygrophanous and change color during dry weather and have scissile thin flesh, others are merely moist and have thicker unchanging flesh. The surface is never viscid. The shape of the pileus varies greatly, convex to plane, obtuse, depressed in the center, umbilicate or infundibuliform; very regular, irregular or compressed when clustered, or often merely wavy in outline. The color of the pileus is generally white to tan, gray, dull reddish or brownish, although a few bright-colored species like *C. illudens* and *C. anisearia* are quite common. The STEM lacks the true cartilaginous rind of the genus Collybia; its outer layer being fibrous or sometimes soft-fleshy, (though it may become hard and cartilaginous-like in dry weather). Within it may be fibrous throughout, i. e., solid, or spongy-stuffed and becoming more or less hollow. The fibrous structure is length-wise and is continued into the trama of the pileus and gives the stem considerable elasticity. The color of the stem is usually like that of the pileus. The GILLS are mostly white, some are ashy-brown, or become ashy-colored in age; in the subgenus Laccaria, they are colored reddish, violet or yellow. They are always attached to the stem, sometimes deeply decurrent, sometimes adnate at first and later pseudo-decurrent when the expanding pileus is elevated anteriorly; whatever the mode of attachment, the gills are narrowed to a point where they terminate on the stem. In one species, *C. laccata*, the gills are aberrant, being emarginate-adnate as in Tricholoma. The gills, when decurrent, are often unequally so, some extending farther down the stem than others, especially when the pileus is irregular. In many species the gills are of different texture from the trama of the pileus and can be peeled off from it, in this character approach-

ing the genus Paxillus as set up by Fries. It has seemed best, however, to follow Peck, by referring white-spored species with decurrent and separable gills, even if they anastomose on the stem, to the genus Clitocybe instead of Paxillus. The VEIL is poorly developed or entirely lacking in this genus. Where it becomes evident, as in *C. praecox* sp. nov. we have a transition to the genus Armillaria. But no species in which the veil forms an annulus can be included here. The SPORES are white, mostly small, elliptical and smooth in the larger number of species, globose and echinulate in others. As seen below, this character with others will be used to separate the two subgenera. The spores of *Clitopilus caespitosa* are only slightly tinged with flesh color, so that it is easily mistaken for a Clitocybe. The TASTE is mild in nearly all the species; sometimes it is farinaceous; in *C. piccina* and a few others it is disagreeable. Two species are known to be poisonous, viz. *C. illudens* and *C. morbifera;* as far as known, the others are safe, and become tender and palatable when properly cooked. *C. sudorifica* Pk. (N. Y. State Mus. Bull. 157) causes profuse perspiration and should be avoided.

The genus is large, and may be divided into two subgenera: Clitocybe (propria), and Laccaria.

The former is again divided into sections and groups as follows:

SUBGENUS CLITOCYBE.

Section I. Paxilloideae.

Section II. Squamulosae.

Section III. Siccae.

Section IV. Hygrophanae.

SUBGENUS LACCARIA.

Key to the Species

(A) Pileus hygrophanous, changing color from wet to dry weather; flesh usually scissile.

(a) Pileus becoming furfuraceous-squamulose; spores spherical, markedly echinulate; gills adnate.

(b) Plant large; stem 8 mm. or more thick; gills purplish. 796. *C. ochropurpurea* Berk.

(bb) Plants rather small; gills flesh color, pallid or violaceous.
(c)) Stem 3-7 cm. long; spores 8-9 micr. diam., very common. 794. *C. laccata* Fr.
(cc) Stem 1-2 cm. long; spores 12-14 micr. diam., rare. 795. *C. tortilis* Fr.
(aa) Pileus glabrous or dotted with dark points.
(b) Pileus thin, funnel-form, cup-shaped or deeply umbilicate at maturity.
(c) Gills distant or subdistant.
(d) Growing on lichens; pileus grayish-brown (moist), very small. 790. *C. peltigerina* Pk.
(dd) Growing on wood, sometimes on the debris of forests.
(e) Pileus virgate, with black scaly points; gills yellowish. 783. *C. ectypoides* Pk.
(ee) Pileus, stem and gills smoky to ashy-brown (moist), pileus glabrous. 782. *C. cyathiforme* Fr.
(cc) Gills crowded or close.
(d) Pileus grayish-brown when moist at least in the center; gills close.
(e) Caespitose; pileus infundibuliform; gills long-decurrent. 787. *C. caespitosa* Pk.
(ee) Not truly caespitose; pileus umbilicate; gills subdecurrent. 786. *C. albidula* Pk.
(dd) Pileus white or whitish-tan, gills very crowded.
(e) Stem attached by long white strands to decayed wood or debris, often eccentric; gills decurrent. 785. *C. eccentrica* Pk.
(ee) Stem without such strands; gills long decurrent. 784. *C. adirondackensis* Pk.
(bb) Pileus obtuse to convex-depressed; plants rather small.
(c) Gills, pileus and stem ashy-colored or brownish-gray.
(d) Taste farinaceous. 789. *C. ditopoda* Fr.
(dd) Taste mild. 788. *C. metachroa* Fr.
(cc) Gills, pileus and stem white or tinged tan color.
(d) Pileus shining-white when dry. 793. *C. angustissima* Fr.
(dd) Pileus not shining-white.
(e) On lawns, etc., among grass. 791. *C. morbifera* Pk.
(ee) In woods, among leaves. 792. *C. compressipes* Pk.
(AA) Pileus not hygrophanous.
(a) Stem 2-6 cm. thick; pileus very large, ochraceous tan, obtuse; gills soon dingy yellowish. 758. *C. maxima* Fr.
(aa) Stem not as stout.
(b) Caespitose, often in large clusters; plants large.
(c) Gills extending down the stem in lines or ridges; pileus dull-white or pale tan. 757. *C. piceina* Pk.
(cc) Gills rarely decurrent in lines.
(d) Pileus becoming deep funnel-shaped or depressed-concave; very large.
(e) Margin of pileus sulcate; gills anastomosing on stem. 755. *C. gigantea* Fr.
(ee) Margin of pileus even; gills rounded behind at first. 756. *C. candida* Bres.
(dd) Pileus obtuse, umbonate or only slightly depressed.
(e) Pileus becoming scaly, reddish-tawny to honey-colored. 759. *C. monodelpha* Morg.
(ee) Pileus glabrous.
(f) Whole plant saffron or dingy golden-yellow. 773. *C. illudens* Schw.
(ff) Plants not at all yellow.
(g) Pileus with a cartilaginous cuticle, smoky-tan or paler. 775. *C. cartilagineus* Bres.

(gg) Pileus without cartilaginous cuticle; whole plant whitish. 774. *C. multiceps* Pk.

(bb) Singly, gregarious or subcaespitose; plants small to medium size; stems seldom over 8 mm. thick.

(c) Pileus yellow, covered with dark brown scales; on wood. 760. *C. decora* Fr.

(cc) Pileus not like the preceding.

(d) Pileus greenish, bluish or yellowish, not scaly.

(e) Whole plant yellowish, soft; spores globose, minutely echinulate. 781. *C. pulcherrima* Pk.

(ee) Tinged green or blue.

(f) Stem solid.

(g) Pileus green or tinged green. 767. *C. odora* var. *viridis* Fr.

(gg) Pileus tinged blue. 771. *C. connexa* Pk.

(ff) Stem stuffed then hollow; pileus greenish.

(g) Gills narrow, crowded. 767. *C. odora* var. *anisearia* Pk.

(gg) Gills rather broad, close. 767. *C. odora* Fr.

(dd) Pileus not green, blue nor yellow.

(e) Pileus funnel-form or deeply concave at maturity.

(f) Pileus buff-white. 776. *C. catina* Fr.

(ff) Pileus reddish-tan fading to dingy white. 777. *C. infundibuliformis* Fr.

(ee) Pileus obtuse, umbilicate or slightly depressed.

(f) Pileus smoky-brown, ashy brown or clouded with gray.

(g) Gills deeply decurrent.

(h) Pileus obtuse, 3-7 cm. broad; gills white or tinged yellowish, subdistant; stem clavate, stout. 763. *C. clavipes* Fr.

(hh) Pileus more or less depressed, 1-3 cm. broad; gills dingy white, close; stem equal, slender. 779. *C. parilis* Fr.

(gg) Gills short-decurrent.

(h) Stem slender, 1-3 mm. thick; pileus depressed; gills tinged ashy. 766. *C. vilescens* Pk.

(hh) Stem stout, 8-16 mm. thick; pileus obtuse to umbonate.

(i) Gills rather crowded. 762. *C. nebularis* Fr.

(ii) Gills subdistant; stem subequal.

(k) Gills entire. 764. *C. media* Pk.

(kk) Gills forked. 765. *C. carnosior* Pk.

(ff) Pileus rufous-brown to brick red; 2-5 cm. broad.

(g) Gills very crowded; flesh thin; pileus umbilicate. 780. *C. sinopica* Fr.

(gg) Gills hardly close; flesh thick on disk; pileus obtuse. 761. *C. praecox* Kauff.

(fff) Pileus whitish to shining white.

(g) Growing on wood; gills narrow and crowded. 772. *C. truncicola* Pk.

(gg) On the ground among leaves, or in grassy places.

(h) Pileus dingy-white to pale tan, umbilicate; on pine needles on the ground. 778. *C. pinophila* Pk.

(hh) Pileus shining-white when dry.

(i) Pileus 3-8 cm. broad; stem solid; spores minutely echinulate. 770. *C. albissima* Pk.

(ii) Pileus smaller, 1-4 cm. broad; stem stuffed to hollow; spores smooth.

(k) Stem cartilaginous; pileus regular; in woods. 768. *C. candicans* Fr.

(kk) Stem fibrous-tough; pileus wavy on margin; usually in fields and pastures. 769. *C. dealbata* Fr.

SUBGENUS CLITOCYBE (propria). Spores elliptical to ovate, when spherical not spinulose (see *C. pulcherrium*).

Section I. Paxilloideae. Pileus firm; flesh thickish, not hygrophanous. Gills separable from trama of pileus, more or less anastomosing on the stem. Plants medium to very large.

755. Clitocybe gigantea Fr. (Edible)

Sys. Mycol., 1821.

Illustrations: Gillet, Champignons de France, Pl. 100.
Cooke, Ill., Pl. 106.

PILEUS *large,* 15-25 cm. broad, relatively thin, soon expanded, plane *then infundibuliform,* soft, glabrous, *white* or tinged tan, slightly flocculose when dry, *margin* involute, then spreading, at length *coarsely sulcate.* Flesh thin, white. GILLS subdecurrent, *very crowded,* rather *broad,* (2-3 times thickness of pileus), some forked, *anastomosing on the stem.* STEM short and *stout,* 2-6 cm. long, 2-3 cm. thick, *solid,* glabrous, even, whitish. SPORES 5 x 3 micr., elliptical, apiculate, white. ODOR and TASTE mild.

(Dried: Pileus rufous-brown in patches, dingy whitish elsewhere. Gills cinnamon brown.)

Caespitose. Ground, in rich woods of maple, oak, basswood, etc. Ann Arbor. September-October. Infrequent. Edible.

Certain remarks found in fungi books indicate that this species needs further study in its relation to *C. maxima* and *C. candida.* Massee says the gills are not separable from the hymenophore, although Fries does not mention the matter in Hymen. Europ., Epicrisis and Systema. The lengthy quotations of McIlvaine do not meet the difficulties in deciding between the three mentioned. This is one of our largest fungi, often a foot across the cap, and a caespitose cluster of them is a marked feature of the forest. It differs, according to our diagnosis, from *C. maxima* by the anastomosing gills, the sulcate-ridged margin of the pileus, lack of any umbo and smooth stem; and from *C. candida* in the character of the gills and the sulcate margin of the pileus. Large fresh clusters of *Tricholoma panoeolum* var. *caespitosum* have all the appearance of this plant, but in that species the gills turn slowly flesh color and the spores are smaller. The illustrations of *C. gigantea* fail to show its size and caespitose character.

756. Clitocybe candida Bres.

Fungi Tridentini, 1881.

Illustrations: Ibid, Pl. XVIII, Vol. I.
Atkinson, Mushrooms, p. 89, 90, Plates 28, 29, Figs. 90, 91.

PILEUS 10-20 cm. broad, convexo-plane, *then depressed and infundibuliform,* relatively thin, glabrous to obscurely scaly on disk, *white,* somewhat shining, *even* or obscurely striate on margin, not umbonate. FLESH white, unchanging, very *scissile.* GILLS subdecurrent, rounded at point of attachment, not emarginate, *very crowded, narrowly linear,* few forked, many shorter, edge entire. STEM 5-9 cm. long, stout, about 2 cm. thick, subequal, spongy-stuffed, white, fibrillose, mycelioid-tomentose at base. ODOR and TASTE mild. SPORES 6-7 x 3-4 micr., elliptical, apiculate, white.
(Dried: Pileus whitish-tan, gills pale fuscous-cinnamon.)
Caespitose. On the ground, under balsam-fir, in conifer forest. Marquette. August. Infrequent.
Differs from preceding in even pileus, in narrow gills which do not anastomose; from *C. maxima* in lack of umbo, gills not long decurrent and pileus not squamulose. Atkinson says gills are broad; in our plants they are narrow as shown in Bresadola's figure. It is made a variety of *C. gigantea* by Quelet, and present information seems to show that the two forms run into each other.

757. Clitocybe piceina Pk.

Torr. Bot. Club. Bull., Vol. 31, p. 178, 1904.

Illustrations: Chicago Nat. Hist. Surv. Bull. VII, Part I, Pl. 2, Fig. 2.
Plate CLIV of this Report.

PILEUS 5-20 cm. broad, rarely more, firm, convex-expanded to *plane,* dull white or tinged ochraceous to tan, dry, obscurely silky, tomentose, margin *even, involute.* FLESH white, rather thick, not scissile. GILLS close, rather narrow, thin, whitish or tinged yellowish, *decurrent* especially *by lines or ridges* running down the stem and *anastomosing,* separable from hymenophore, transversely split in age, edge entire. STEM 5-8 cm. long, 1-3 cm. thick, short and *stout,* solid, firm, sometimes spongy, subequal to subbulbous, whitish, *minutely tomentose,* often curved at base, *rigid at apex.*

SPORES broadly elliptical, 6-7 x 4-5 micr., apiculate, with a large oil-drop nearly filling the interior, white. ODOR strong, somewhat aromatic to disagreeable. TASTE unpleasant, bitter.

(Dried: Cap and gills dingy ochre to ochraceous-buff.)

Single or subcaespitose. On very rotten wood, or on debris under hemlock trees in northern Michigan; under maple, etc., in the southern part of the State. Ann Arbor, New Richmond, Detroit, Houghton, Huron Mountains, Marquette. Infrequent. Edibility not tested.

This is one of the large Clitocybes, one of my specimens measuring 25 cm. across the cap. It is easily known by the peculiar gills and the narrow ridges at the apex of the stem. The change to yellow on drying is very marked, and distinguishes this species from *C. gigantea* and *C. candida*. Small to medium plants are apparently more common than those of full size. The oil-drop in the spores is large and simulates a globular spore. The white mycelium gives a white, mouldy appearance to the neighboring leaves, etc. It appears to be the same as *Paxillus extenuatus* Fr., in the sense of Ricken.

758. Clitocybe maxima Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Barla, Champignons des Alpes-maritimes, Pl. 50. Plate CLV of this Report. (Much reduced.)

PILEUS 10-30 cm. or more broad, thick-fleshy, firm, *at first broadly convex with broad umbo, then plane,* scarcely subinfundibuliform in age but obtuse or broadly umbonate, always dry, with a thin, interwoven, silky-tomentosity on surface, slightly floccose-scaly in age, at first pallid, *soon ochraceous-tan to rusty alutaceous,* margin at first involute and pubescent-tomentulose, then spreading and *even* or only obscurely short-striate. FLESH *thick and compact on disk,* abruptly thin toward margin, later attenuated, whitish becoming dingy. GILLS at first subemarginate becoming decurrent to long-decurrent in fully expanded plants, relatively narrow (4-10 mm.), acuminate at both ends, *close,* not ventricose, whitish at first, *soon dingy yellowish*, pale tan in age, separable from pileus, edge entire. STEM *stout* and usually *short,* 6-12 cm. long, inflated-bulbous to clavate-bulbous, 2-5 cm. thick above, 3-8 cm. at bulb, *spongy-solid, covered by a thin,* continuous, appressed

white *tomentum,* often ferruginous-stained, white or whitish, bulb at length color of pileus. SPORES elliptic-oval, 7-7.5 x 5-5.5 micr., obscurely echinulate, nucleate, white. CYSTIDIA none; *sterile cells* on edge of gills acicular. ODOR *rather strong,* oily-farinaceous. TASTE mild.

Gregarious or subcaespitose. On the ground in frondose woods. Ann Arbor, Detroit. August-September. Infrequent.

In America this huge and massive mushroom is distinguished by its exceedingly stout stem, by the compact flesh of the half-grown plant, by the gills which soon become deep straw-yellow and by the odor. When developing slowly the pileus remains compact and thick on the central portion, but under favorable growth-conditions it expands more fully, the flesh becomes thinner throughout and it tends to become infundibuliform. The majority of plants found, although many of them very large, had a plane or obtuse pileus, sometimes with a very broad umbo. Solitary, relatively small specimens approach the appearance of the figures given for *C. geotropa* Fr. and such specimens being the only ones seen the first time the species was found, I referred them to *C. geotropa* Fr.; later collections showed me the error. The gills in the young plants are merely sinuate-emarginate, but when the pileus expands they become decurrent. The decurrent character of the gills is not as strongly marked as the European descriptions indicate, and our plant departs from European forms in several particulars. Fries (Monographia) says the gills are whitish, not changing, whereas the yellowish to tan color which the gills soon assume in our plants is one of the most marked characteristics, becoming more noticeable after the specimens are picked. The thin tomentose coating on the stem, its bulbous tendency and the rusty-tan color of the old plants is also not mentioned. Clearly we have a distinct American form. The relation between *C. maxima* and *C. gigantea* does not seem to be clear to most European authors. The two are very distinct as Fries has pointed out. The American *C. gigantea* has a whitish, thinner, much more infundibuliform pileus and its gills are more crowded and anastomose on the stem, and the margin of the pileus is strongly marked by sulcate-ridges. The attachment of the gills relates this to the genus Tricholoma. But in all other respects it is a Clitocybe of the Paxilloideae group.

Section II. Squamulosae. Surface of pileus broken up into scales, dry; flesh rather thick, stem scaly or fibrillose.

759. Clitocybe monadelpha Morg. (Edible)

Jour. Cinn. Soc. of Nat. Hist., Vol. VI, 1883.

Illustrations: Ibid, Pl. 4.
N. Y. State Mus. Memoir, Vol. III, No. 4, Pl. 46, 1900.
Hard, Mushrooms, p. 103, Pl. XXI, Fig. 75, 1908.
McIlvaine, Amer. Mushrooms, p. 88, Pl. XXVII.

PILEUS 3-10 cm. broad, size very variable in a cluster, convex then plane, obtuse, depressed in age, entire surface dry, *becoming innately fibrillose-scaly,* scales floccose and more dense on disk, *rufous-tawny* to chestnut on disk, honey-colored beneath scales, margin recurved and splitting in age. FLESH white or tinged ochraceous-brown, very thick on disk. GILLS subdecurrent, subdistant, rather broad in the middle, tapering to both ends, intervenose, *pallid then dull flesh color* and often stained with brown spots, edge entire. STEM *elongated,* 7-20 cm. long, tapering downward and *attenuated at the caespitose and crowded bases,* fibrous-stuffed, at length hollow, densely fibrillose or fibrillose-scurfy, glabrescent, twisted, pallid then fuscous-brown, darker to blackish-brown at base, brownish within. SPORES broadly elliptical, 6-7.5 x 5-5.5 micr., smooth, white. ODOR and TASTE mild, or slightly bitter.

(Dried: Umber-brown.)

Very caespitose. On the ground in woods, usually attached to old roots or rotten wood. New Richmond. September. Rare.

This is apparently the American form of *C. tabescens* Bres. of Europe. In the few collections examined, the spores of the native plant rarely measured over 7 micr. long, while Bresadola gives 8-10 x 5-7 micr. for his species. When young this species simulates *Armillaria mellea,* but without a veil, later it is not easily confused with it. The scales on the cap are often well-developed.

760. Clitocybe decora Fr.

(= *Tricholoma multipunctum* Pk.)

Syst. Mycol., 1821. (N. Y. State Mus. Rep. 25, 1873.)

Illustration: Fries, Icones Select, Vol. I, Pl. 60.

PILEUS 3-6 cm. broad, convex, rather thin, depressed in center or plane, yellow (luteous) or tinged brown or olivaceous, covered with dense, innate, fibrillose, minute, blackish or brownish scales, disk darker. FLESH yellowish. GILLS *obtusely adnate,* crowded, seceding, yellow, rather narrow. STEM 3-6 cm. long, 4-10 mm. thick, subequal, stuffed then hollow, yellow, dotted with minute scales, central or eccentric. SPORES variable, broadly-ovate to subelliptical, 6-7 x 4.5-5.5 micr., mixed with a large per cent of young globose spores 4-5 micr. diameter.

Single or subcaespitose. On rotten logs, in hemlock and spruce swamp. Sault Ste. Marie. July-September.

The generic position of this species is unsettled. Fries first placed it under Clitocybe, then Pleurotus. Gillet referred it to Clitocybe; Quelet to Tricholoma; Saccardo to Pleurotus. Peck name it anew *Tricholoma multipunctum,* then referred it back to *Clitocybe decora,* where it is to be hoped it will remain. It is an aberrant Clitocybe, like *C. laccata,* in departing from the manner in which in this genus the gills are attached.

761. Clitocybe praecox sp. nov.

Illustration: Plate CLVI of this Report.

PILEUS 2-5 cm. broad, fleshy, *dry,* convex, then plane or obtuse, somewhat irregular, or deformed, sometimes lobed, *flocculose or covered with minute rufous-brown scales,* umber-brown or paler when young; margin incurved at first, obscurely fibrillose, even. FLESH whitish, thick on disk. GILLS acutely subdecurrent, close to subdistant, not broad, narrowed toward both ends, whitish or ward, obscurely bulbous, curved, *solid,* fibrous, dotted below with venose. STEM 3-4 cm. long, 6-8 mm. thick, equal or tapering downward, obscurely bulbous, curved, *solid;* fibrous, dotted below with delicate floccose scales from the veil, mealy at apex, at length silky-fibrillose throughout, pallid to brownish, white within, outer rind

subcartilaginous. VEIL thin, fibrillose, whitish, evanescent. SPORES broadly elliptical, 7-9.5 x 5-6 micr., smooth, obtuse, white; basidia 4-spored. CYSTIDIA none. ODOR and TASTE strong, farinaceous.

Singly or subcaespitose. On lawns, parks, etc. Ann Arbor. April 20-June 1. Edibility not tested.

First found on the Campus of the University of Michigan among moss and grass through which it pushed and which probably caused its deformed appearance. The earliest specimens mature slowly. The collapsing veil at first leaves remnants on the stems in the form of obscure, transverse, delicate rings or scales, which soon disappear. Its scaly cap and veil indicate that it is related to the Friesian section "Versiformis" but the flesh is not hygrophanous. It has some affinities with *C. incilis* Fr.

Section III. Siccae. Pileus not scaly nor hygrophanous; flesh not watery nor scissile.

Subsection I. Disciformis. Pileus convex, then plane or depressed, obtuse, *regular;* gills equally decurrent. Stem *simple* or somewhat subcaespitose.

**Pileus cinereous or fuscous.*

762. Clitocybe nebularis Fr. (Edible)

Syst. Mycol., 1821.

Illustrations: N. Y. State Mus. Rep. 48, Pl. 23, 1896.
Fries, Sverig. ätl. u. gift. Svamp., Pl. 45.
Gillet, Champignons d. France, Pl. 115.
Bresadola, Fungh. mang. e. vel., Pl. 33.
Cooke, Ill., Pl. 79.
Michael, Führer f. Pilzfreunde, Vol. II, No. 84.

PILEUS 5-9 cm. broad, convex, then plane, obtuse, rarely depressed, margin often wavy, even, *subpruinose*, glabrescent, *smoky-brown to grayish-buff*, margin pliant and soft. FLESH pure white, thick on disk, thin on margin. GILLS subdecurrent finally decurrent, *crowded*, attenuate at both ends, narrow, white then dingy or tinged gray, edge entire. STEM stout, 5-7 cm. long, 1-2.5 cm. thick, sub-clavate at base, or subventricose, *fibrous-spongy and*

solid, pruinose, smoky-buff, concolor, even. SPORES minute, 5-6 x 3-4 micr., elliptical-ovate, smooth, white. ODOR and TASTE mild or very slightly acrid.

(Dried: Cap grayish-brown to smoky-isabelline; gills ochraceous-buff.)

Subcaespitose. Ground in woods of oak, maple, etc. Ludington, Ann Arbor. September. Infrequent.

This is called the "Clouded Clitocybe," because of the smoky hue of cap and stem. The spores of the American plant seem to be smaller than those of the European species, since Bresadola gives them 9 x 6-7 micr. Some specimens have a bit of acridity to the taste, a fact also recorded by Barla in Europe. McIlvaine, Bresadola, Cooke, Badham, Quelet and Michael report it as edible. Older authors in Europe have reported it as unsafe, e. g. Cordier, Paulet and Barla. The American plant has no evidence against it. It is sometimes attacked by another mushroom, *Volvaria loveianus,* which forms fruit-bodies on its cap. (See Fig. 7, Pl. XI, Swanson, Fungi.)

763. Clitocybe clavipes Fr. (Edible)

Syst. Mycol., 1821.

Illustrations: N. Y. State Mus. Mem., Vol. III, No. 4, Pl. 46, 1900.
Fries, Icon., Vol. I, Pl. 47.
Gillet, Champignons de France, Pl. 117.
Cooke, Ill., Pl. 80.
Hard, Mushrooms, p. 94, Fig. 69.

PILEUS 2-7 cm. broad, soft, convex then plane, almost obconic, rarely umbonate, obtuse, even, *glabrous, sooty-brown,* fuscous-cinereous to brown, sometimes paler. FLESH white, thick on disk. GILLS deeply *decurrent, subdistant,* rather broad in middle, narrowed toward both ends, flaccid, white or tinged yellowish, edge entire. STEM 2-6 cm. long, 6-8 mm. thick at apex, clavate at base, tapering upwards, sometimes bulbous, concolor, spongy-solid, white within, fibrillose. SPORES 6-7.5 x 4-5 micr., subelliptical, smooth, white. ODOR and TASTE agreeable.

(Dried: Pileus fuscous-cinnamon; gills sordid gilvous.)

Scattered or tufted. On the ground, mostly reported in conifer woods, but also in southern Michigan, under maple, oak, etc. September-October. Infrequent. Edible.

Water-soaked in wet weather. Differs from *C. nebularis* in its subdistant, decurrent gills, and slightly larger spores.

764. Clitocybe media Pk. (Edible)

N. Y. State Mus. Rep. 42, 1899.

Illustrations: Ibid, Pl. 1, Figs. 9-12.
N. Y. State Mus. Rep. 48, Pl. XXIII, Fig. 1-7, 1896.
Hard, Mushrooms, p. 88, Fig. 64, 1908.

This is a variety of the preceding, recognizable by the subequal, not bulbous stem, broader and more distant gills, varying decurrent. The spores are 7.5-8 x 5 micr. TASTE mild. Edible.

On the ground, in oak, maple or birch woods. Marquette, Ann Arbor.

765. Clitocybe carnosior Pk.

N. Y. State Cab. Rep. 23, p. 76, 1872.

This may be considered as another *variety* of *C. clavipes,* distinguished by the forked gills. The pileus is brown to grayish-brown. TASTE pleasant. Habit, etc., of the type. Marquette. August.

766. Clitocybe vilescens Pk.

N. Y. State Mus. Rep. 33, 1880.

PILEUS *small*, 1-3 cm. broad, convex then plane and obtuse or slightly umbilicato-depressed, fragile, glabrous, even, pale-ashy to brownish-ashy, sometimes subpapillate, slightly pruinose at first on the involute margin. FLESH whitish, soft, thickish. GILLS subdecurrent, whitish tinged ashy, close, moderately narrow, occasionally veined. STEM *slender*, 2-5 cm. long, 1.5-4 mm. thick, concolor or paler, solid, glabrous, equal, straight or curved, white-mycelioid at base. SPORES short and subglobose or broadly elliptical, 5-6 x 3-5 micr., smooth, white. ODOR and TASTE mild.

(Dried: Cap grayish, gills dingy pale tan.)

In frondose or mixed woods. July-August. Marquette, Ann Arbor. Infrequent.

****Pileus greenish.**

767. Clitocybe odora Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde, No. 86.
Fries, Sverig. ätlig. u. gift Svamp., Pl. 85.
Gillet, Champignons de France, No. 113.
Marshall, Mushroom Book, p. 71, Pl. XV. (As *Clitocybe or virens.*)
Conn. Nat. Hist. Surv. Bull. 3, Pl. XVII.

PILEUS 3-8 cm. broad, rather thin, convex then expanded-plane, subrepand, even, glabrous, margin incurved and pliant, sometimes substriate, *pale dingy-green to bluish-green* varying to whitish. FLESH white, *rather tough.* GILLS *rather broad,* close, adnate-decurrent, white then yellowish or tinged green. STEM 3 to 8 cm. long, 4-6 mm. thick, equal or thickened below, pruinose at apex, stuffed then hollow, white mycelioid or often soft-spongy at base, white or tinged green. SPORES 6-8 x 4-5 micr., broadly elliptical, smooth, white. ODOR *fragant,* sometimes evanescent. "Flavor, when cooked, rather strong, but not unpleasant." (McIlvaine.)

(Dried: Green color disappears; pileus grayish-tan to dark fuscous; the deep green colored pileus darkest when dried, those merely tinged green, paler; gills alutaceous.)

Subcaespitose, base of stem often deeply sunk in leaves and forest-mould. In conifer and broad-leaved forest. Marquette, Houghton, Ann Arbor. August-September. This typical form is rare.

This species runs into two varieties, *C. anisearia* Pk. and *C. viridis* Fr., of which the first variety is by far the commonest of the three in Michigan. The odor is usually strongly fragrant, but is variable, so that a normal green plant may be almost inodorous in age, further, the color varies to white with no sign of green, in which case the odor may be very marked. The color may therefore be white, or tinged a delicate green, dull uniformly green, grayish-green to bluish-green. The variability of the plant has caused some uncertainty as to whether our form is the same as the European plant. Our commonest form or variety has *narrow, crowded* gills, and is given below as *C. anisearia* Pk. Fries and others describe *C. odora* with *broad* gills, not crowded; and *C. viridis* with *crowded, white* gills and *solid* stem. I believe

that all these characters are variants of one species, and have been unduly emphasized. The European plants as well as ours are *edible,* though strong-flavored when alone.

Var. *anisearia* (*Clitocybe anisearia* Pk.) (EDIBLE.)

N. Y. State Mus. Rep. 32, 1879.

Like the preceding, of which it may be considered a variety. It differs in the *narrow, crowded* gills, and perhaps in the stronger development of the fibrillose cuticle of the cap. The gills are white then cream-color. SPORES, etc., the same. Habitat the same.

Houghton, Marquette, Ann Arbor, Detroit, New Richmond, etc. Common throughout the State. August-October. Edible.

Var. viridis (*Clitocybe virdis* Fr.)

Syst. Myc., 1821.

This variety, with the *solid* stem, has not been found in Michigan. Fries separated it because of information he obtained from others. He never saw it. Cooke and others consider it identical with *C. odora.* Under certain conditions of growth, the interior "stuffed" center of stems of mushrooms often appears as if composed of the same substance and texture as the rest of the stem, i. e., as if "solid," and care must be taken to distinguish between such appearances.

****Pileus white or whitish.*

768. Clitocybe candicans Fr.

Syst. Myc. Fr., 1821.

Illustrations: Fries, Icones, Pl. 51, Fig. 3.
Cooke, Ill., Pl. 82.
Gillet, Champignons de France, Pl. 110.

"PILEUS 2-3 cm. broad, thin, dry, convex then plane or depressed, *shining white* in dry weather, with a superficial micaceous silkiness, dull white when moist, even, *margin decurved, regular.* FLESH white, thin. GILLS adnate then decurrent, crowded, very thin, narrow, white, edge entire. STEM 2-5 cm. long, 2-4 mm. thick, even, equal, *waxy-shining, cartilaginous, glabrous,* stuffed then hollow, curved and villose at base, somewhat rooting among

the leaves, etc., to which it is attached. SPORES *broadly-elliptical* to subglobose, 5.5-6 x 4 micr., smooth, white. ODOR and TASTE mild."

Subcaespitose. Among leaves, etc., in woods. Reported by Longyear.

The cartilaginous stem and broader spores separate it from *C. dealbata* and the other Clitocybes. In the character of the stem it approaches the genus Omphalia.

769. Clitocybe dealbata Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 104.
Gillet, Champignons de France, Pl. 111.

PILEUS 1-4 cm. broad, convex then expanded, depressed in center, or umbilicate, glabrous, even, dry, *shining-white,* margin *undulate and becoming recurved* or ascending, very thin. FLESH white, thin. GILLS adnate then subdecurrent, persistently white, rather narrow, *crowded*, thin, edge entire or minutely erose. STEM 2-3 cm. long, 2-5 mm. thick, rather slender, stuffed then hollow and often compressed, white to pallid, *tough* and fibrous, straight, glabrous, even, equal, base oblique and villose, apex subpruinose. SPORES narrowly elliptical-oval, 4-5.5 x 2.5-3 micr., apiculate, nucleate, smooth, white; basidia 4-spored. ODOR and TASTE mild.

(Dried: Cap buff-white, gills whitish, stem sordid.)

Subcaespitose, usually in *tufts* as figured by Cooke. Attached to decaying leaves in pastured woods of deciduous trees; also on lawns and pastures. Ann Arbor, etc. September-November. Frequent.

This species is known by its persistently white cap and gills, small size, etc. The tendency of mycologists to describe new varieties of it, shows that it varies considerably. Peck has named a variety growing in mushroom beds var. *deformata*. The above description applies to the Ann Arbor form. It is very probable that there are intermediate grades between this species and *C. candicans*. Our plants were thin, and hence more like *C. candicans*. The two differ from such species as *C. albissima* Pk. and *C. phyllophila* Fr. in the entire absence of a yellowish color in cap or gills when old or dried. The stem is toughish-fibrous instead of cartilaginous as in *C. candicans;* the other points of difference are italicised, but may

all vary. Some say the caps of both species are sometimes mamillate. Our plants grow in the woods among leaves, in twos or singly, and might be taken for *C. candicans* if one failed to examine the stem structure and the spores. The minute spores are only slightly different in the two species, but can be used as a good diagnostic character, since those of *C. candicans* are broader and shorter.

770. Clitocybe albissima Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 3-8 cm. broad, *medium large*, convex to expanded, dry, *thin and flexible, pure shining white;* not changed by weather, very regular, margin subzonate. FLESH white. GILLS close, short decurrent, narrow, whitish. STEM 5-8 cm. long, 5-10 mm. thick, subequal or tapering upward, *solid* or sometimes with cavity at one place, glabrous above, subtomentose towards spongy base. SPORES 6-8 x 4-5 micr., broadly elliptical, thin-walled, *minutely spinulose.* ODOR sometimes slightly of radish. TASTE slightly bitter or mild.

(Dried: Cap soft and white; gills yellowish.)

Gregarious, sometimes in fairy-rings.

In conifer woods of northern Michigan, Marquette, Greenville. August-September. Infrequent.

The snowy-white cap and size distinguish *C. albissima* from *C. candicans* and *C. dealbata.* In our specimens, which were identified by Peck, the gills become yellowish in dried specimens, while the cap, as in *C. dealbata*, retains its whiteness. The spores are unique in being very minutely echinulate, like those of *C. pulcherrima.* It is said to be close to *C. cerussata* Fr. of Europe, which has globose spores. Our specimens reported as *C. cerussata* in 12th Report, Michigan Academy of Science, were found to belong here.

771. Clitocybe connexa Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 5-7 cm. broad, convex, then expanded, subumbonate, minutely silky, *white, sometimes faintly tinged blue*, especially on margin. GILLS crowded, narrow, decurrent, whitish. STEM 5-7 cm. long, 4 mm. thick, equal or tapering upwards, *solid*, whitish. SPORES ovoid, 7 x 5 micr."

Reported by Longyear, Jackson County. Apparently rare.

Morgan says the pileus is sometimes quite bluish. The gills are said to be rounded behind and to imitate the genus Tricholoma. The odor is weak but aromatic.

772. Clitocybe truncicola Pk.

N. Y. State Mus. Rep. 26, 1874.

"PILEUS 2-5 cm. broad, thin, firm, expanded and slightly depressed, glabrous, dry, white. GILLS narrow, thin, crowded, adnato-decurrent, white. STEM equal, stuffed then hollow, glabrous, often eccentric and curved. SPORES oval, 4-5 x 3-4 micr."

On logs and branches of maple. Our specimens were found on old roots of maple. September. Detroit.

A few other species of Clitocybe are partial to wood, e. g., *C. cyathiforme* Fr., *C. leptoloma* Pk., *C. ectypoides* Pk., and *C. decora* Fr.

Subsection II. Difformis. Pileus thick on disk, convex to plane, obtuse or umbonate, *irregular.* Gills unequally decurrent or variable in this respect, some rounded behind as in Tricholoma. Stem *caespitose,* stout in our species.

773. Clitocybe illudens Schw. (Poisonous)

Synopsis Fung. Carolina, 1822.

Illustrations: McIlvaine, Amer. Fungi, Pl. 29 a, p. 96, 1900.
Marshall, Mushroom Book, p. 70, 1904.
Hard, Mushrooms, Pl. 10, Fig. 67, p. 92, 1908.
Conn. Nat. Hist. Surv. Bull. 3, Pl. 18, 1905.
Rep. 32, Geol. and Nat. Resources Ind., p. 1231, Fig. 8, 1907.
N. Y. State Mus. Mem. 4, Pl. 68, 1900.

PILEUS 8-20 cm. broad, thick, convex to expanded, plane or depressed, glabrous, often umbonate, bright *golden or saffron yellow, irregular,* or lobed, margin elevated in age but often decurved. FLESH white to yellowish. GILLS unequally long decurrent, close, *yellow,* becoming discolored, narrowed to both ends, sometimes forked. STEM *long,* 7-20 cm. long, 1-1.5 cm. thick, *firm,* solid, glabrous, *irregularly and variously curved or twisted, narrowed at base, concolor,* becoming darker at base. SPORES globose, 4-5

micr. diameter, white, copious. ODOR and TASTE strong and disagreeable.

Caespitose. On and around old stumps or decaying roots, forming large clusters often of 25-50 individuals. August-October. Frequent. Unsafe.

An attractive-looking mushroom, forming large golden-yellow masses, which catch the eye from a distance. It has poisonous properties, however, which affect most people with nausea and vomiting. When fresh clusters are brought into a dark room, it is shown to be strongly phosphorescent. This phenomenon is accompanied by a liberation of heat. The species is not found in Europe, and was first discovered by Louis de Schweinitz in North Carolina. Most of the photographs mentioned above look like *Armillaria mellea* without rings. I have seen it but occasionally about Ann Arbor, though Longyear marks it "common."

774. Clitocybe multiceps Pk. (Edible)

N. Y. State Mus. Rep. 43, 1890.

Illustrations: N. Y. State Mus. Bull. 139, Pl. 117, 1910.
Clark & Kantor, Mycologia, Vol. 3, Pl. 52.
Atkinson, Mushrooms, 2d ed.
McIlvaine, Amer. Mushrooms, Pl. 27 a, p. 94, 1900.
Plate CLVII of this Report.

PILEUS 3-8 cm. broad, thick on disk, *firm,* convex, *white or whitish,* sometimes tinged gray or yellowish-gray, even, moist, glabrous, regular or irregular. FLESH pure white. GILLS *close, adnate to slightly decurrent,* sometimes sinuate, whitish, medium broad. STEM 5-10 cm. long, 6-12 mm. thick, *stout, solid,* equal or slightly thickened at base, glabrous or pruinose at apex, white or whitish. SPORES globose, 5-8 micr. in diameter, smooth, white. TASTE slightly unpleasant.

(Dried: Caps grayish-fawn color, gills pale cinnamon.)

Very caespitose. Pastures, fields, grassy roadsides, open woods usually of broad leaved trees. Ann Arbor, Bay View, Marquette, New Richmond, etc. June to October. Frequent. Edible but not of the best variety for culinary purposes.

Except in color and in the nature of the cuticle of the cap, this species approaches *C. cartilaginea* Bres. The variations in the

attachment of the gills shade into the genus Tricholoma. *C. multiceps* appears after prolonged rainy weather, and when developed rapidly it is quite tender and sweet. The clusters are often densely crowded and may usually be recognized by their firmness and dull white color.

775. Clitocybe cartilaginea Bres.

Fungi Tridentini, 1892.

Illustration: Ibid, Pl. 111.

PILEUS 4-8 cm. broad, convex, obtuse, dry, *provided with a cartilaginous cuticle, smoky-tan or whitish-tan,* tinged with gray or brown, glabrous, even, margin splitting. FLESH white, *thick.* GILLS *crowded,* attenuate subdecurrent, sometimes adnate and becoming sinuate or almost free when old, *narrow,* tough, subcartilaginous, attenuate at both ends, sordid white to *pale straw color.* STEM 5-7 cm. long, tapering upwards or subequal, 1-2 cm. thick at apex, stout, paler than pileus, somewhat spongy-clavate at base, cuticle toughish, solid, pruinose above, subfibrillose, bases somewhat connate. SPORES globose, 5-7 micr., nucleate, smooth, white. CYSTIDIA none; basidia 30-32 x 6-7 micr. ODOR and taste mild.

Caespitose. In woods. June, etc.

Sent in from outside the southern boundary of the State, and apt to occur within the State. The darker colors of the cap, and the straw-colored, truly crowded gills seem to be the only characters besides the cartilaginous cuticle of the pileus, by which to separate pale forms of *C. cartilaginea* from *C. multiceps.* Superficially, the habit, etc., of the two species are much the same. It was placed among the Tricholomas by Fries as *T. loricatum.* When quite young the color of the pileus is smoky-black.

Subsection III. Infundibuliformis. Pileus at length infundibuliform or deeply umbilicately depressed. Gills deeply and equally decurrent from the first. Color of pileus often fading but not hygrophanous.

776. Clitocybe catina Fr.

Epicrisis, 1836-38.

Illustration: Fries, Icones, Pl. 51, Fig. 4.

PILEUS 3-5 cm. broad, pliant, convex-infundibuliform, *regular, glabrous,* with a gelatinous feel when moist, not striate on margin (moist or dry), buff-white, after repeated rains pale dingy brownish, moist, not hygrophanous, never becoming shining-white, margin decurved. FLESH thin, *white, toughish.* GILLS decurrent, *crowded,* narrow, *dull whitish,* never yellowish nor cinereous, simple, edge entire. STEM 3-4.5 cm. long, 3-5 mm. thick, equal, terete, *straight,* stuffed then hollow, *tough,* white becoming sordid, pruinose above, tomentose toward base. SPORES ovate, 4-5.5 x 3 micr., smooth, white. CYSTIDIA none. ODOR farinaceous.

Gregarious or scattered, on the ground among leaves and pine needles in woods of beach and white pine. New Richmond. September-October. Abundant locally.

This seems to be merely a form of *C. catina,* from which it varies slightly. The gills are more crowded and after rains no incarnate tint is noticeable. It agrees very well in other respects with the figures and descriptions of Fries. The plants have the size and much the shape of *C. infundibuliformis,* but the latter has a reddish-tan colored cap when young, fading in age. *C. catina* is watery-whitish when fresh and the surface of the pileus becomes perfectly smooth and almost slippery, but is not truly hygrophanous. The shape of the cap is that of a regular vase or deep bowl and this character gives it the name. The pileus is more regular and smaller than *C. phyllophila* although the two species may apparently be easily confused.

777. Clitocybe infundibuliformis Fr. (Edible)

Elenchus Fungorum, 1828.

Illustrations: Cooke, Ill., Pl. 107.
Bresadola, Fungh. mang. e. vel., Pl. 38.
Gillet, Champignons de France, Pl. 107.
Hard, Mushrooms, p. 89, Pl. 9, 1908.
Conn. Geol. and Nat. Hist. Surv. Bull. 3, Pl. 19, 1905.
Plate CLVIII of this Report.

PILEUS 5-7 cm. broad, at first convex and *subumbonate* then depressed and finally entirely *infundibuliform,* dry, flaccid, coated with a delicate silkiness, *reddish to pale tan color,* fading with age, margin even and thin. FLESH white, thickish on disk. GILLS deeply decurrent, close, *thin,* white or whitish, narrow, acuminate at both ends, edge rather serratulate. STEM 4-8 cm. long, 5-10 mm. thick, tapering slightly upward, glabrous, spongy within, externally firm, rather elastic, pale reddish or pallid, white-mycelioid at base where attached to leaves, etc. SPORES ovate to subpyriform, obliquely sharp-pointed and apiculate, 5-8 x 3-4 micr. when mature, smaller when immature; basidia 4-spored. ODOR pleasant, TASTE mild.

(Dried: Cap reddish-tan, gills alutaceous to tan.)

Single or somewhat caespitose. Attached to decaying leaves and debris in both conifer and non-coniferous woods. Throughout the State as far as Isle Royale. July-October. My first record is July 8, the last October 20. Very common.

This is one of the first species to appear after the July rains set in. It becomes very robust at times, simulating *C. geotropa,* but the spores are longer than in that species. (See Patouillard, Tab. Analyt.) The color of the cap changes in a definite direction; when young and fresh the red color is predominant, when old the whitish hues appear. *C. flaccida* Fr. is said to differ in the tawny to rust-colored pileus which does not fade in age; I have been unable to recognize it in this State. The gills become yellowish. Its shape and habit are like *C. infundibuliformis,* and are therefore well shown in the illustrations of the latter. Both are edible and not likely to be confused with any injurious mushrooms.

778. Clitocybe pinophila Pk.

N. Y. State Mus. Rep. 31, 1879.

PILEUS 2-3 cm. broad, convex, then plane and slightly umbilicate, subinfundibuliform in age, moist, glabrous to minutely squamulose, *tan-color* to dingy-white, even on margin. FLESH whitish. GILLS subdecurrent, close, *narrow*, intervenose, whitish. STEM short, 1.5-2 cm. long, 2 mm. thick, equal, even, *solid*, fibrillose to pruinose, concolor. SPORES elliptical-ovate, narrowed to the apiculus, 5-6 x 4 micr., smooth, white. CYSTIDIA none; basidia 4-spored. ODOR farinaceous. TASTE farinaceous slowly becoming biting to the tongue.

Gregarious. On beds of pine needles, under white pine. New Richmond. September. Infrequent.

The plants do not agree in every respect with Peck's description. The stem is solid when fresh and young. It seems to approach two other species, *C. gallinacea* Fr. and *C. pithyophila* Fr. From *C. gallinacea, C. pinophila* differs in color and habitat and in the tendency to become infundibuliform; from *C. pithyophila, C. pinophila* differs in its small size, color and solid stem, etc. The acridity is slight. We need more microscopic data on these three species.

779. Clitocybe parilis Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Vol. I, Pl. 48.
Cooke, Ill., Pl. 281.

PILEUS 2-3 cm. broad, convexo-plane, obtuse, depressed or cup-shaped, dry, *minutely flocculose-scaly, brownish-ashy*, margin even, decurved and flexible, splitting when old. FLESH thin, white, soft. GILLS close to subdistant, long decurrent, arcuate, narrow, becoming dingy-white, *at first slightly cinereous*, few forked. STEM 3 cm. long, 2 mm. thick, equal or subequal, even, pruinose, glabrescent, terete, toughish, stuffed, pale ashy to pallid, base white mycelioid. SPORES 6 x 3.5 micr., elliptic-ovate, smooth, white. TASTE slightly but tardily disagreeable. ODOR somewhat farinaceous.

Singly or gregarious. On the ground in frondose and mixed woods. Ann Arbor. New Richmond. October. Infrequent.

Our specimens had close gills, whereas the European plant is said to have crowded gills. Otherwise it seems to belong here. Barla says the odor is like that of *Armillaria caligata,* or of *jasmine,* at first agreeable then nauseous.

780. Clitocybe sinopica Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 647.
Fries, Icones, Pl. 55, Fig. 2.
Gillet, Champignons de France, No. 105.

"PILEUS 2-3 cm. broad, thin, soon plane and depressed, *umbilicate,* dry, at first glabrous then flocculose, brick-red then becoming pale. FLESH white, elastic. GILLS decurrent, *very crowded, rather broad,* white becoming yellowish. STEM 2-4 cm. long, 3-8 mm. thick, stuffed, *equal,* subfibrillose, concolor or yellowish. SPORES 6-8 x 4-5 micr. ODOR and TASTE strong, farinaceous."

Woods. Spring and summer. Infrequent. Reported by Longyear. *C. praecox* might be mistaken for it, but that species has a stouter habit, is quite fleshy on the disk, and the gills are not at all crowded.

781. Clitocybe pulcherrima Pk.

Jour. of Mycology, Vol. 14, 1908.

PILEUS 3-7 cm. broad, convex, then umbilicate-depressed, *citron-yellow to cream-color* (Sacc.), fading, opaque, moist, not hygrophanous, *soft,* slightly silky-tomentose on disk, margin even. FLESH white or sometimes tinged cream color, thin on margin. GILLS equally decurrent, *narrow,* subdistant, *ochraceous-yellow,* few forked, edge entire. STEM 4-8 in. long, equal or subequal, spongy at base, stuffed then hollow, at first silky-tomentose then fibrillose with loose longitudinal fibrils, even. SPORES globose, 4-5.5 micr. diameter, *minutely echinulate,* white. ODOR and TASTE mild.

On decaying leaves or wood. Detroit, New Richmond. September-October. Infrequent.

The above description was made from fresh co-type material, at the time the type was sent to Peck. The spores have an obscure angularity, and are very minutely spinulose. In this character

they approach *C. spinulosa* Smith, a British species, whose spinulose spores are said to be larger, as much as 8-9 micr. The type was found near Detroit by members of the Detroit Mycological Society. I found it again in the western part of the State. It seems to be rather rare. Its yellow color is unusual in this genus. *C. sulphurea* Pk. has a streaked yellow pileus and stem, adnate gills and larger spores.

Section IV. Hygrophanae. Pileus thin, hygrophanous, not scaly. Flesh soft, watery, scissile.

Subsection I. Cyathiformis. Pileus depressed then cup-shaped: flesh scissile, thin.

**Gills cinereous.*

782. Clitocybe cyathiforme Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 113.
Plate CLIX of this Report.

PILEUS 2-7 cm. broad, thin, convex, soon plane and umbilicate-depressed, or *cup-shaped,* hygrophanous, fuliginous-brown when young and moist, becoming brownish-gray, glabrous or innately fibrillose, opaque, margin involute and even. FLESH watery, concolor, scissile. GILLS becoming acuminate-decurrent, narrow, *subdistant,* intervenose, varying to close or distant, grayish-brown, edge entire. STEM 4-7 cm. long, 3-6 mm. thick, tapering upwards, *spongy-stuffed, elastic, brownish to cinereous,* fibrillose when fresh, the fibrils forming reticulations, tomentose at base. SPORES 7-9.5 x 5-6 micr., occasionally some larger, elliptical-ovate, with an oblique apiculus, smooth, white; sterigmata stout; basidia 4-spored. ODOR slightly aromatic or none, TASTE mild.

(Dried: Pileus smoky-fuscous to smoky cinnamon; gills brownish-gray.)

Scattered, *on rotten wood,* logs, etc. Ann Arbor, Bay View, Marquette, New Richmond. In coniferous, mixed or frondose woods. September-October. Infrequent.

This is an autumnal species, and with us always occurs on rotten wood. The gills are said to be distant in the European plants.

The gills of our plants are never separated to such extent; they are either truly subdistant or rather close. *C. expallens* Fr. is a species with close gills, but European mycologists seem to consider that this is an ecological variant of *C. cyathiforme.* Excepting the gills all the characters of our specimens are those of the European *C. cyathiforme,* and I am inclined to think that variations with close gills will also have to be included under *C. cyathiforme.* The spores of our collections are all alike, although quite variable in single plants. Barla says the odor is that of hay. Although the gills are ashy-brown, the spores are white. Peck has described two related species, *C. subcyathiforme* and *C. subconcava. C. subcyathiforme* is watery-white on the cap when moist, and the gills are white, but the stem is fibrillose-reticulate as in *C. cyathiforme,* the spores slightly smaller; *C. subconcava* has a brownish to reddish-brown cap, its gills are close and subcinereous, but the spores are only 5-6 x 3-4 micr. I have not seen them.

***Gills yellowish.*

783. Clitocybe ectypoides Pk.

N. Y. State Mus. Rep. 24, 1872.

PILEUS 2-5 cm. broad, thin, broadly umbilicate to infundibuliform, finely *virgate* with close-pressed blackish fibrils, *squamulose-punctate, the black points seated on the radiations,* hygrophanous, watery-gray to dull watery-yellow, margin spreading and even. FLESH with an aqueous juice, concolor. GILLS long decurrent, narrow, sometimes forked, *subdistant* or nearly so, *yellowish.* STEM 2-5 cm. long, 2-4 mm. thick, equal, firm, *solid,* concolor or paler, white-mycelioid at base. SPORES elliptical, 8-9 x 4-5 micr., smooth, white.

Scattered, on rotten logs in conifer or mixed woods of northern Michigan. Bay View, Marquette, Huron Mountains. August-September. Frequent locally.

The pileus is sometimes irregular, and the stem may be eccentric. In our plants the gills are always more nearly subdistant than close.

***Gills whitish.*

784. Clitocybe adirondackensis Pk. (Edible)

N. Y. State Cab. Rep. 23, 1872.

Illustrations: N. Y. State Mus. Rep. 54, Pl. 69, 1901.
Hard, Mushrooms, Fig. 71, p. 97, 1908.

PILEUS 2-5 cm. broad, thin, convex then plane and *umbilicato-depressed* to infundibuliform, glabrous, hygrophanous, *white or tinged tan-color*, margin at first decurved, then elevated, even, *with a narrow zone near the edge when moist.* FLESH white, thin. GILLS long decurrent, *crowded, very narrow,* thin, white. STEM 3-7 cm. long, 2-4 mm. thick, cylindrical, *glabrous, stuffed then hollow,* even, white or whitish, mycelioid-thickened at the base. SPORES minute, elliptical-ovate, smooth, 4-5.5 x 3-3.5 micr. TASTE "like that of the common mushroom," Peck.

(Dried: Cap and gills ochraceous-tan, stem paler.)

Gregarious or subcaespitose among leaves, etc., in frondose and mixed woods. Ann Arbor, Marquette, Detroit. Frequent. August-October.

The characters are well shown in Dr. Fischer's photograph in Hard's book. The crowded narrow gills, the dingy white color of the cap varying into a circular zone near the edge, and the stuffed stem distinguish the plant. It seems to be quite common on wooded hillsides of southern Michigan. It approaches *C. eccentrica.*

785. Clitocybe eccentrica Pk.

Bull. Torr. Bot. Club, Vol. 25, p. 321, 1898.

PILEUS 2-5 cm. broad, convexo-plane, umbilicate then infundibuliform and turbinate, glabrous, subhygrophanous, *watery-white and shining when moist,* sometimes tinged ochraceous, buff whitish when dry, the thin surface layer slightly differentiated into long subgelatinous cells, the thin margin even, often lobed, split and finally recurved. FLESH thin, whitish. GILLS *short-decurrent* from beginning, *very crowded, narrow,* somewhat forked, *dingy-white.* STEM 2-4 cm. long, 2-4 mm. thick, slender, equal, stuffed, fibrous, elastic, whitish, pruinose above, *base inserted by a tuft of strigose hairs and continued into the substratum by long white*

strings or rhizomorphs, often eccentric. SPORES very minute, 4-5 x 2-3 micr., elliptical-ovate, smooth, white. ODOR mild, TASTE sometimes slightly bitter.

(Dried: Cap and gills pale rufous-tan.)

Caespitose or scattered. On very rotten wood in mixed and frondose woods. Ann Arbor, Bay View, Houghton, etc. July-September. Frequent throughout the State.

This species approaches *C. adirondackensis,* from which the short decurrent gills, the different lustre of the cap and the rhizomorphs at the hairy base of the stem separate it; the spores too, average half a micron smaller. These differences may be merely an expression of habitat, since the one grows mainly on rotten wood, the other among leaves and humus. Another species of Peck, said to grow on rotten wood, is *C. leptoloma.* Here also, the strigose base of the stem and the rhizomorphs are about the only characters of *C. eccentrica* which separate it. It is likely that these three species are variations of one of them.

786. Clitocybe albidula Pk.

N. Y. State Mus. Rep. 46, 1893.

Illustrations: N. Y. State Mus. Rep. 53, Pl. C, Figs. 16-20.

PILEUS 1-4 cm. broad, thin, convex-plane, umbilicate, subhygrophanous, *pale grayish-brown* to whitish, the *umbilicus always darker and brown,* glabrous, margin faintly striatulate. GILLS subdecurrent, crowded, narrow, thin, sometimes forked, intervenose, whitish. STEM 2-5 cm. long, 2-4 mm. thick, equal, stuffed then hollow, concolor, fibrous-toughish, even, white-mycelioid at base. SPORES 5-6 x 3-4 micr., elliptic, smooth, white. ODOR and TASTE farinaceous.

Gregarious, in woods of hemlock and cedar. Bay View. September. Infrequent.

A form occurs with creamy-white pileus and brown umbilicus with spores the same. This form has only a faint odor, but no doubt belongs here. The brown umbilicus and slightly larger spores, along with the grayish tinge in the color, separate this species from the preceding two. It never becomes truly cyathiform nor infundibuliform.

787. Clitocybe caespitosa Pk.

N. Y. State Mus. Bull. 41, 1888.

"PILEUS 2-4 cm. broad, convex-plane then infundibuliform, *often irregular,* slightly silky, hygrophanous, *grayish-brown when moist,* subcinereous or argillaceous when dry. GILLS decurrent, narrow, close, somewhat forked, white. STEM 2-3 cm. long, 4-6 mm. thick, equal, stuffed then hollow, silky, white. SPORES minute, subelliptical, 3-4 micr. long."

In woods. Caespitose, the caps deformed and made irregular by mutual pressure. Reported by Longyear.

Subsection II. Orbiformis. Pileus convex then plane or slightly depressed, often obtuse, polished, not squamulose nor mealy.

*****Gills grayish.*

788. Clitocybe metachroa Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 115.
Patouillard, Tab. Analyt., No. 308.

PILEUS 1-4 cm. broad, thin, convex then plane and depressed, *at first dark-fuscous* then brownish-gray or livid (moist), dull grayish-white (dry), hygrophanous, glabrous, margin even, substriate (dry). FLESH thin, concolor. GILLS adnate to slightly subdecurrent, sometimes by lines, *crowded,* narrow, dark fuscous when young, *then whitish-ashy,* thin, at length flaccid, edge entire. STEM 3-4 cm. long, 2-4 mm. thick, subequal, even, at first *dark fuscous and pruinose-silky,* then grayish and glabrescent, stuffed then hollow, often compressed, toughish. SPORES minute, ovate, 5 x 2.5 micr., smooth, white. CYSTIDIA none. ODOR none or faintly farinaceous after crushing the flesh. TASTE mild.

Gregarious or scattered. On the ground in frondose and conifer woods. Ann Arbor, Marquette. September-November. Infrequent.

The color of the whole plant changes remarkably from the young stage to maturity and in age. *C. ditopoda* Fr. is similarly colored, differing mainly in its strong farinaceous odor and probably in the spore characters. It should not be confused with *C. cyathiforme,* which is larger, has larger spores and usually grows on wood.

789. Clitocybe ditopoda Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 116.

PILEUS 2-5 cm. broad, convex then subexpanded and *umbilicate-depressed,* pliant, glabrous, even, hygrophanous, *cinereous or grayish-brown* (moist), dull white (dry), margin somewhat irregular. FLESH thin. GILLS adnate or scarcely subdecurrent, *crowded,* rather narrow, pallid at first, soon *cinerascent* and smoky-gray, edge entire. STEM 2-3 cm. long, 3 mm. thick, terete or more *often compressed,* irregular, *pale cinereous,* stuffed soon hollow, pruinose downwards. SPORES elliptic-ovate, 5-6 x 3-4 micr., smooth, white. CYSTIDIA none. ODOR and TASTE farinaceous.

Gregarious or subcaespitose. On the ground, among needles and debris of tamarack trees in wet swamp.

Ann Arbor. October-November. Infrequent.

This species was abundant in this one locality. It has much in common with *C. metachroa,* but differs from it in the farinaceous odor and in the different color changes in passing from the young to the old stage. The plants also do not have the stiff appearance of *C. metachroa.*

790. Clitocybe peltigerina Pk.

N. Y. Mus. Rep. 30, 1878.

PILEUS 4-10 mm. broad, *small,* subexpanded, umbilicate, hygrophanous, *grayish-brown and striatulate when moist,* whitish to pale gray when dry, glabrous. GILLS decurrent, *distant,* narrow, somewhat forked and intervenose, *grayish-brown,* thickish, pruinose. STEM 1-2 cm. long, 1.5 mm. thick, equal, solid, elastic, pallid or tinged grayish-brown, pruinose below, base minutely tomentose. SPORES elliptical-ovate, pointed-apiculate, 8-10 x 4-5.5 micr., smooth, white; basidia 4-spored; cystidia none. ODOR and taste none.

Singly or subcaespitose. On Peltigera, one of the lichens. Ann Arbor. May 5. Rarely found.

Remarkable for its habitat. It is small and imitates the color of its substratum and is easily overlooked.

****Gills whitish.**

791. Clitocybe morbifera Pk. (Poisonous)

Bull. Torr. Bot. Club, Vol. 25, p. 321, 1893.

Illustration: Plate CLIX of this Report.

PILEUS 1.5-4 cm. broad, convex then plane, sometimes slightly depressed or obtuse, hygrophanous, or at least moist, glabrous, grayish-brown to grayish-buff when moist, *white to alutaceous when dry*, somewhat reviving, margin even and incurved. FLESH thin, whitish. GILLS adnate-decurrent, moderately close, slightly broad in middle, narrowed to a point at both ends, whitish, becoming pale tan in age, thin, edge entire. STEM 2-3.5 cm. long, 2-4 mm. thick, subequal, *solid* and *spongy-fibrous within, pruinose,* slightly fibrillose, *tough,* colored like pileus or paler, straight or curved, not slender.

Microscopic: SPORES oval, minute, about 5 x 3 micr., white, smooth, usually poorly developed; basidia about 20 micr. long; trama of gills of parallel hyphae, 4 micr. in diameter; trama of pileus only slightly wider, all of the trama being composed of compact, narrow, long hyphae; the cuticle is not noticeably differentiated. Cystidia none. ODOR none. TASTE varies, sometimes slight, when fresh it is slightly astringent.

(Dried: Entirely dirty white or grayish-white.)

Singly or subcaespitose among grass *on lawns,* roadsides, etc. Specimens from Adrian found under a syringa bush and elsewhere. October. Adrian, Ann Arbor, and Detroit. Frequency not yet certain, as it is probably often overlooked. *Poisonous.*

This is apparently a dangerous plant. In the case of *C. illudens,* there is no uncertainty in its recognition, as it is more brightly and differently colored than any related mushrooms; but *C. morbifera* has many near relatives which, like *C. dealbata,* are sometimes difficult of separation. Fortunately, no one except beginners, or extreme mycophagists, collect these small species. Still the fact that it grows on lawns where only edible species are normally found, makes this a troublesome intruder. Several families in different parts of the country are now known to have been made sick from eating it. Peck reports a case from Washington, D. C., from which source came the material for his description. Our specimens were sent by E. D. Smith from Adrian, Michigan. Several persons in

Adrian ate *C. morbifera* with a mess of *L. naucina.* The victims suffered blindness, swollen throat, etc. Our specimens did not have the marked taste described by Peck, nor a truly "hollow" stem. It is doubtless the same species however.

792. Clitocybe compressipes Pk.

N. Y. State Mus. Rep. 33, 1880.

PILEUS 2-5 cm. broad, convex then plane and depressed or subumbilicate, hygrophanous, thin, glabrous, *pale watery-brown and even when moist,* whitish or tinged tan when dry, edge of margin persistently incurved. FLESH rather thin, concolor, upper layer of trama differentiated and composed of delicate, long, subgelatinous cells. GILLS subdecurrent, close, rather narrow, *pale watery-ochraceous or brownish when moist,* whitish when dry, intervenose. STEM short, 2-3 cm. long, 2-3 mm. thick, soon hollow and compressed, equal, even, glabrous or subvillose, grayish-brown to pallid, attached by tomemtum to leaves, etc. SPORES 4-5.5 x 2.5-3.5 micr., elliptical-ovate, smooth, white. ODOR and TASTE mild.

(Dried: Cap pale tan to dingy white, gills sordid white.)

Scattered or subcaespitose. Among leaves in frondose woods. Ann Arbor. September-October. Infrequent.

These plants do not have the farinaceous odor which is present in *C. albidula* of conifer woods.

793. Clitocybe angustissima Fr.

Epicrisis, 1836-38.

Illustrations: Fries, Icones, Pl. 59, Fig. 2.
Gillet, Champignons de France, No. 111.
Cooke, Ill., Pl. 125.

PILEUS 2-5 cm. broad, convex-expanded, *obtuse or subdepressed,* subhygrophanous, glabrous, *watery-white, candicans,* even (moist), slightly striatulate (dry), margin spreading, at length recurved. FLESH thin, whitish. GILLS slightly *subdecurrent,* very narrow, *very crowded,* thin, whitish, edge entire. STEM 3-5 cm. long, slender, 2-5 mm. thick, whitish, flexuous or curved at base, equal or tapering downward, *apex naked,* pubescent at base. SPORES short elliptical, 5-7 x 3-4 micr., smooth. CYSTIDIA none. BASIDIA about 27 x 6 micr., 4-spored. ODOR none or faint.

Scattered, on the ground among leaves in low frondose woods. September. New Richmond. Infrequent.

This is one of a number of similar species, in this case well-marked by the very crowded and narrow whitish gills, the watery-white color and the lack of odor. *C. albidula* Pk. differs mainly in its farinaceous odor. *C. compressipes* Pk. can probably be differentiated by its close rather than very crowded gills and by the compressed stem; both of Peck's species are said to have the caps tinged brownish when moist, and not shining-white (candicans) as in *C. angustissima.*

SUBGENUS LACCARIA. Spores globose, echinulate; pileus usually minutely scaly or floccose.

794. Clitocybe laccata Fr. (Edible)

(*Laccaria laccata*)

Syst. Myc., 1821.

Illustrations: N. Y. State Mus. Rep. 48, Pl. 25, 1896.
Murrill, Mycologia, Vol. 3, Pl. 40, Fig. 4.
Hard, Mushrooms, Fig. 76, 77, p. 105, 1908.
Cooke, Ill., Pl. 139.
Patouillard, Tab. Analyt., No. 104.
Gillet, Champignons de France, No. 99.

PILEUS 2-5 cm. broad, thin, convex then plane, subumbilicate, variable in shape, hygrophanous, glabrous at first, then scurfy-scaly, pale red to flesh-red when moist, pale ochraceous-whitish when dry. FLESH thin, moist. GILLS broad, *distant,* broadly emarginate, tinged flesh color, white-pruinose. STEM 2-7 cm. long, 2-6 mm. thick, slender, equal, *fibrous and tough,* stuffed, *pale flesh-red,* sometimes striate. SPORES globose, 8-10 micr., echinulate, spines 1 mm. long, white. ODOR agreeable. TASTE fungoid.

Scattered everywhere in woods, groves, swamps or grassy places, on naked soil, mosses, or leaves, etc. Throughout the season; my earliest record is May 5, the last November 8. Everywhere in the State, in coniferous or frondose woods. Very abundant in wet weather. It is edible, but not particularly well-flavored.

Varieties occur, and the common form shades gradually into var. *striatula* Pk., var. *amethystina* Bolt and var. *pallidifolius.* Var.

striatula Pk. has a very thin cap which is radially striate from near the umbilicate center; spores 9-11 micr. diam., globose, echinulate, the spines about 1 micron long. Var. *amethystina* Bolt. has a darker cap, and beautiful deep-violaceous gills, which are broadly adnate-decurrent. The spores of our specimens of var. *amethystina* are like those of the normal form. Var. *pallidifolia* Pk. is like the common form except that the gills are pallid. This species and its varieties are sometimes confused with *Lactarius subdulcis.*

795. Clitocybe tortilis Fr.

(*Laccaria tortilis*)

Hymen. Europ., 1874.

Illustration: Patouillard, Tab. Analyt., No. 105.

PILEUS 5-12 mm. broad, submembranaceous, convex then expanded and depressed on disk, *distantly radiately striatulate from the center* when moist, hygrophanous, pale reddish or salmon color, pruinose, disk whitish-scurfy, margin sometimes plicate or splitting, often deformed or irregular. GILLS *distant,* rather narrow, *adnate-subdecurrent,* thick, not forked nor veined, salmon-colored, edge concolor. STEM 1-2 cm. long, 1 mm. thick, slender, equal, *fibrous-toughish, stuffed with a white pith,* pellucid flesh color, glabrous, base white-mycelioid. SPORES *large, globose,* long-echinulate, white, 12-14 micr. diam.; basidia 2-spored.

On the ground, in wet places, sometimes on moss. Marquette. August-September.

This is a distinct species and must not be confounded with *C. laccata* nor its varieties. The spores are nearly twice as large as in that species. It is easily mistaken for a species of the rosy-spored genus Eccila. It has sometimes been referred to as a variety of *C. laccata.*

796. Clitocybe ochropurpurea Berk. (Edible)

(*Laccaria ochropurpurea*)

Illustrations: N. Y. State Mus. Bull. 116, Pl. 106, 1907.
Hard, Mushrooms, p. 98, Pl. XI, Fig. 72, 1908.
Chicago Nat. Hist. Surv., Bull. VII, Fig. 2, 1909.

PILEUS 5-20 cm. broad, sometimes large, *subhemispherical,* then convex with a decurved margin or nearly plane or depressed, *compact,* rather thick, hygrophanous, purplish-brown when moist, pale grayish-alutaceous when dry, unpolished, margin regular or wavy, upturned in age. FLESH *tough,* concolor or pallid. GILLS *distant, thick,* broad, *adnato-decurrent, purple.* STEM 5-20 cm. long, 1-2 cm. thick, varying much in length and shape, subequal to fusiform or cylindrical, fibrous, often rigid and hard, solid, concolor or paler, sometimes curved or twisted. SPORES globose, short-echinulate, 8-9.5 micr., white, or tinged in mass with a lilac hue. TASTE rather disagreeable.

(Dried: Cap and stem grayish-white to sordid-white, gills smoky-fuscous.)

Scattered or subcaespitose. On bare ground or open grassy places, preferring a hard soil, often in woods, conifer, mixed or frondose. From Isle Royale to the southern limit of the State, everywhere. July-October.

Not as common as *C. laccata.* In its colors and shape it appears somewhat like a purple-gilled Cortinarius, but its texture is different and it lacks a veil. It becomes tender and of agreeable flavor when cooked.

Collybia Fr.

(From the Greek, *kollybos,* a small coin; probably because of the regularity of the disk-like pileus.)

White-spored. Stem *cartilaginous* or with a cartilaginous cuticle. Pileus *soon expanded,* not very fleshy, *its margin at first involute.* Gills adnate, adnexed or almost free, *not decurrent.* Spores mostly small or minute, smooth. Volva and annulus lacking.

Putrescent, thin capped, mostly lignicolous mushrooms, of slow growth, not reviving when moistened except in the section Marasmioideae, and, with few exceptions, of medium or small size. They are mostly attached to decayed wood, like stumps, logs, old buried roots, twigs, leaves, etc.; a few species even occur on decayed mushrooms, while others seem to grow on naked soil. The genus is most closely allied to Marasmius, but the plants differ in not reviving after drying up; from Mycena, the involute margin of the pileus, with its resultant expansion at maturity, is the main distinction. As this is only clearly seen in the very young stage, it is often difficult in mature plants to decide whether one has a Collybia or

Mycena. In the majority of Collybias, however, the pileus is expanded at maturity, but in Mycena the pileus usually remains campanulate.

The PILEUS is rarely brightly colored. The color may be brown, ashy, blackish, tan, yellowish, white, or shades of these colors. A few have a viscid cap, and in one section the cap is hygrophanous; it is glabrous except in *C. longipes,* and some of the Marasmioideae. In several of the hygrophanous species the margin is striatulate when moist. The GILLS are submembranous and soft, and continuous with the trama of the pileus. They are usually white, yellowish, rufescent or ashy. In one species they are lilac. Some mycologists have divided the sections by the difference in the width of the gills, some species have quite broad gills, others narrow gills. The mode of attachment separates the genus from Omphalia and Clitocybe, since they are never decurrent. The STEM is primarily cartilaginous, as in Mycena, Omphalia and many Marasmii. This character is not always easily recognized, and in some large species like *C. platyphylla,* the otherwise soft stem may mislead one. Furthermore, the stems of plants belonging to the fleshy-stemmed genera may, on drying in the wind, become somewhat cartilaginous in texture, so as to be mistaken for true cartilaginous forms. The base of the stem is usually rooting, sometimes remarkably so, as in *C. radicata,* and *C. longipes.* Some species have glabrous stems, while one section is composed of species with hairy, floccose, or pruinose stems. The presence of deep or at least evident striations running up and down the stem is used to set off another section. A few small species form a small sclerotium from which the fruit-body develops.

No poisonous species of Collybia are known, although the smaller species have probably never been tested. Many of the large species are of good flavor and much sought.

It is probable that some forty-five species occur within the State, but so far only thirty-four have been identified. The species have been grouped in various ways by different authors. In the main, the Friesian arrangement is retained, although somewhat modified. It seemed that relationships could be better shown by using the color of the gills to divide the main sections, rather than divide the whole genus into two main groups having white and cinereous gills respectively as Fries had done. A new section has been established to contain those species which approach the genus Marasmius. This is called the Marasmioideae and serves as a bridge to that genus. The genus is therefore composed of the five sections:

I. Tephrophanae.
II. Laevipedes.
III. Striaepedes.
IV. Vestipedes.
V. Marasmioidae.

Key to the Species

(A) Not reviving when moistened. [See also (AA).]
(a) Stem velvety, tomentose, floccose or pruinose. [For *C. myriadophylla* with lilac gills, see (aa).]
(b) Stem with a dense, tawny-brown to blackish, velvety covering.
(c) Pileus with a viscid, even, separable pellicle; mostly caespitose. 818. *C. velutipes* Fr.
(cc) Pileus not viscid, striatulate; growing scattered. *C. amabilipes* Pk.
(bb) Stem not densely velvety.
(c) Flesh changing to purplish-black where cut or bruised; stem fuliginous, pubescent. 820. *C. succosa* Pk.
(cc) Flesh not changing black; gills white or whitish.
(d) Pileus 2.5-5 cm. broad.
(e) Stem very long, deeply rooted; pileus velvety, brown. 819. *C. longipes* Fr.
(ee) Stem 3-4 cm. long covered with a close white tomentum, not rooting; pileus glabrous, whitish to pale reddish on disk. 825. *C. hariolorum* Fr.
(dd) Pileus less than 2 cm. broad; stems slender. (Mycena-like plants.)
(e) Stem arising from a small tuber, on decaying mushrooms or rich mold; pileus small, 1 cm. or less, whitish. 823. *C. tuberosa* Fr.
(ee) Stem not arising from tuber-like sclerotia.
(f) Growing on pine cones, needles, etc.
(g) Pileus 1-3 cm. broad, fuscous; stem elongated by a tomentose "root." *C. conigena* Fr.
(gg) Pileus 2-10 mm. broad, creamy-white to pale brownish, minutely pubescent. 822. *C. conigenoides* Ell.
(ff) Growing on the ground, humus, etc.
(g) Pileus whitish, faintly reddish-tinged; stem white-pulverulent. 824. *C. cirrhata* Fr.
(gg) Pileus grayish-brown to smoky-brown; stem white, under lens with minute dark points. 821. *C. floccipes* Fr.
(aa) Stem glabrous (often tomentose-hairy at base and pruinose at apex).
(b) Stem deeply rooting.
(c) Pileus viscid, radiately wrinkled, grayish, brown, or almost white; gills pure white; very common. 815. *C. radicata* Fr.
(cc) Pileus not viscid, hygrophanous, rufous-tan, smaller; gills dingy flesh color. 806. *C. hygrophoroides* Pk.
(bb) Stem without a long, root-like prolongation.
(c) Pileus large, 6-12 cm. broad.
(d) Gills broad, subdistant; pileus grayish-brown, etc., streaked with darker fibrils. 816. *C. platyphylla* Fr.
(dd) Gills narrow, crowded.
(e) Stem equal, subbulbous at base; pileus whitish, tinged creamy-yellow. 812. *C. albiflavidum* Pk. (*Tricholoma albiflavidum*).

(ee) Stem narrowed toward base, short-rooting.
(f) Gills yellow or yellowish; pileus ochraceous, not stained. 817. *C. scorzonerea* Fr.
(ff) Gills white or whitish; pileus stained ferruginous in spots. 817. *C. maculata* A. & S.
(cc) Pileus less than 6 cm. broad.
(d) Pileus white, small, 4-10 mm. broad.
(e) Gills narrow; spores narrowly-elliptical, 10 x 4-5 micr. *C. delicatella* Pk.
(ee) Gills broad, ventricose; spores subglobose, 4-5 x 3-4 micr. *C. alba* Pk.
(dd) Pileus not truly white.
(e) Gills lilac-color, narrow, very crowded; pileus 1-2.5 cm. broad. 807. *C. myriadophylla* Pk.
(ee) Gills some other color.
(f) Gills white or whitish.
(g) Gills rather broad, ventricose.
(h) Odor alkaline when crushed; pileus grayish-umber, hygrophanous, striatulate. 801. *C. alcalinolens* Pk.
(hh) Odor not alkaline.
(i) Taste bitter; pileus pale yellowish-brown, umbilicate. *C. esculentoides* Pk.
(ii) Taste farinaceous; pileus and stem dark rufous-brown, obtuse. 814. *C. succinea* Fr.
(gg) Gills rather narrow.
(h) Caespitose or densely gregarious on decaying logs; pileus grayish-brown to buff.
(i) Pileus subumbilicate, not hygrophanous; gills adnate. 813. *C. abundans* Pk.
(ii) Pileus obtuse, hygrophanous; gills nearly free. 802. *C. familia* Pk.
(iii) See also *C. dryophila.*
(hh) Solitary, gregarious or subcaespitose.
(i) Pileus smoky-brown; not hygrophanous; stem 4-6 mm. thick, brown. *C. fuliginella* Pk.
(ii) Pileus pale, chestnut, reddish-brown, yellowish brown, waxy-yellow or tan.
(k) Stem striate; pileus umbonate; gills crenulate on edge. 797. *C. butyracea* Fr.
(kk) Stem not striate.
(l) Stem reddish-brown or yellowish, pileus pale reddish-brown, yellowish, tan, etc. 798. *C. dryophila* Fr.
(ll) Stem white or whitish.
(m) Pileus yellowish-white tinged rufous, slightly rugose; stem strict. 800. *C. strictipes* Pk.
(mm) Pileus reddish-brown to chestnut (moist); gills serrate on edge. 799. *C. lentinoides* Pk.
(ff) Gills not at length white or whitish.
(g) Gills yellow or yellowish.
(h) On decaying wood, scattered; pileus yellow; gills brownish-red on drying. 804. *C. colorea* Pk.
(hh) On the ground, caespitose; pileus watery-rufous-brown at first, then honey-yellow. 803. *C. aquosa* Fr. var.
(gg) Gills soon rufescent or cinerascent or darker.
(h) Pileus pale tan or flesh-reddish (moist); gills tinged flesh color. 805. *C. acervata* Fr.

(hh) Pileus hygrophanous, blackish or smoky-brown at first; gills cinerascent or dark brown.
(i) Odor and taste farinaceous; pileus striatulate (moist). 811. *C. expallens* Pk. var.
(ii) Odor none or slight; pileus even.
(k) Stem 2-3 cm. long, pileus umbilicate, pitch-black (moist); on burnt ground. 808. *C. atrata* Fr.
(kk) Stem longer; pileus blackish-chestnut (moist), obtuse; on mossy ground. 809. *C. plexipes* Fr. var.
(kkk) Stem 2-3 cm. long; pileus grayish-brown; gills fuscous; on wood. 810. *C. atratoides* Pk.

(AA) More or less reviving when moistened.
(a) Pileus umbilicate, fibrillose-hairy.
(b) Pileus 1-2.5 cm. broad, zonate, dark tawny. 827. *C. zonata* Pk.
(bb) Pileus 0.5-1 cm. broad, umbilicus papillate. 828. *C. stipitaria* Fr.
(aa) Pileus not umbilicate.
(b) Pileus and stem sulphur-yellow, tough, sub-rigid. 830. *C. lacunosa* Pk.
(bb) Not yellow.
(c) Pileus 2-5 cm. broad, convex-plane, hygrophanous; stem densely whitish-pubescent; on the ground. 826. *C. confluens* Fr.
(cc) Pileus 5-8 mm. broad, conical-campanulate; stem institititious, on twigs of arbor vitae. 829. *C. campanella* Pk.

Section I. Tephrophanae. Pileus more or less hygrophanous; at least watery.

**Gills white or whitish.*

797. Collybia butyracea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde, Vol. III, No. 104.
Cooke, Ill., Pl. 143 (faded).
White, Conn. State Geol. and Nat. Hist. Surv. Bull. 15, Pl. VIII, 1910.
Gillet, Champignons de France, No. 149 (faded).

PILEUS 3-7 cm. broad, convex-expanded, *umbonate* to subumbonate, even, glabrous, reddish-brown, darker when young, fading with age, surface *with a fatty lustre when moist,* subhygrophanous, or watery and soft in wet weather. FLESH becoming white, thickish on disk. GILLS adnexed, almost free, crowded, thin, rather narrow, *white,* edge *crenulate.* STEM 3-7 cm. long, conico-attenuated upwards, 4-6 mm. thick above, at length subequal and subbulbous, *striate,* glabrous or slightly downy toward base, cuticle rigid-cartilaginous, base mycelioid. SPORES 5-7 x 3-3.5 micr., nar-

rowly ovate, pointed-apiculate, smooth, white; CYSTIDIA none. ODOR and TASTE mild.

Solitary or gregarious. Very common in woods of white pine, New Richmond; infrequent in frondose woods, Detroit, Ann Arbor and Marquette. July-October.

The "buttery Collybia" is often hard to separate from *C. dryophila* by descriptions, and there are probably intermediate forms. The typical plant seems to be limited to *coniferous woods.* The striate stem influenced Fries to refer it to the Striaepedes; but it seems to belong more naturally to this group, from its general appearance and the somewhat hygrophanous flesh. The umbo often disappears somewhat in age, but the crenulate gills, and striate stem seem quite consistent for the typical plants of conifer woods. The spores of this species and several of those following are practically the same. It is probable that the form in frondose woods is an ecological variety, as it rarely possesses a distinct umbo.

798. Collybia dryophila Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 204.
Gillet, Champignons de France, No. 156.
Michael, Führer f. Pilzfreunde, Vol. III, No. 103.
Patouillard, Tab. Analyt., No. 315.
Murrill, Mycologia, Vol. 3, Pl. 40, Fig. 8.
N. Y. State Mus. Bull. 122, Pl. 111, 1908 (coloring poor).
Plate CLX of this Report.

PILEUS 3-5 cm. broad, convex-expanded, obtuse or depressed, often irregular, even, glabrous, subhygrophanous, color variable, *tan, with reddish or yellowish shades,* disk darker, sometimes bay-brown, often faded. FLESH white, rather thin and pliant, somewhat watery. GILLS adnexed or narrowly adnate, *narrow, crowded, whitish* or pallid (yellowish in variety), edge entire or minutely crenulate. STEM 3-6 cm. long, 2-4 mm. thick, equal or tapering upward, *reddish-brown* or yellowish-tinged, usually concolor, glabrous, hollow, cuticle cartilaginous, white-mycelioid at base. SPORES 5-7 x 3.5 micr., smooth, narrowly ovate, white, CYSTIDIA none. ODOR and TASTE mild.

Gregarious or subcaespitose. Typical form in hard-wood forests, groves, etc. June to October. (Earliest record, May 28; latest, October 4.) Very common, throughout the State.

This species is the center of a "group," including *C. butyracea, C. lentinoides, C. estensis* Morg., *C. aquosa* and *C. acervata,* which may be called the "dryophila" group. There seem to be a whole series of variations, connecting *C. dryophila* and *C. butyracea* on the one hand, and *C. dryophila* and *C. aquosa* on the other. It is difficult in many cases to refer individual collections in a very strict way to the species mentioned, except by generalizing the descriptions. In this report, it seemed best to select plants which well fit the Friesian descriptions, and draw our descriptions from them, and consider intermediate plants as "forms" or "varieties" of these, leaving such identifications to the students. Secretan, long ago, named a number of these varieties; but such names carry very little meaning, as even the varieties may vary. It is very probable that the varieties occur under different influences of habitat, i. e., grow in different soil, under different moisture conditions, etc. The spore print is white at first, but may become yellowish-tinged with age. The plants appear at their best growing from thick mats of leaves and humus, and are then often caespitose and the stems are covered toward the base with a white down. The caps are delicious when fried with bread-crumbs and egg.

799. Collybia lentinoides Pk.

N. Y. State Rep. 32, 1879.

"PILEUS 1-2.5 cm. broad, convex or nearly plane, obtuse, glabrous, *hygrophanous,* reddish-brown or chestnut color when moist, reddish-tan color when dry. GILLS adnexed, narrow, close, *white,* serrate on edge. STEM 3-5 cm. long, about 2 mm. thick, equal, even or slightly striate, hollow, slightly pruinose at top, *white or whitish.* SPORES 6-7.5 x 4 micr.

"This species bears some resemblance to *C. dryophila,* from which it is differentiated by its hygrophanous pileus, serrated gills and white stem."

Reported by Longyear. Swamps. Summer. Apparently rare.

800. Collybia strictipes Pk. (Edible)

N. Y. State Mus. Rep. 41, 1888.

Illustration: Plate CLXI of this Report.

PILEUS 2.5 to 6.5 cm. broad, convex then plane, margin at

length raised, obtuse to subdepressed, *slightly rugose on disk,* rarely even, glabrous, *subhygrophanous,* yellowish-white, tinged with red, more deeply colored on disk, margin often slightly striate when moist. FLESH thin, watery-white when moist. GILLS adnexed or nearly free, rather crowded, medium width, *white or whitish,* edge minutely fimbriate. STEM 2-5 cm. long, 3-6 mm. thick, strict, *equal,* hollow, terete or subcompressed, sometimes twisted, even, glabrous, pruinose at apex, *white to pellucid,* white-mycelioid or strigose at base. SPORES narrowly elliptic-ovate, 6.5-8 x 3-3.5 micr., pointed at one end, smooth, white in mass. CYSTIDIA none; *sterile cells* on edge of gills short and slender. ODOR and TASTE mild.

Gregarious or scattered. Low, moist, rich frondose woods; on the ground or among mosses. Ann Arbor and New Richmond. Probably throughout the State. September-October. Infrequent.

The straight, pellucid-white stem and rugose cap distinguish it. Luxuriant specimens have rugose lines over the whole surface of the cap. The colors are rather clear compared with those of *C. dryophila* and *C. butyracea.* Peck compares it with *C. maculata,* from which it is easily distinct. *C. estensis* Morg. (Cinn. Soc. of Nat. Hist. Journ., Vol. 6, 1883, Plate 5) is very close, and may be a variety.

801. Collybia alcalinolens Pk.

N. Y. State Mus. Rep. 49, 1896.

Illustration: Plate CLXII of this Report.

PILEUS 1-2.5 cm. broad, at first ovate with incurved margin, *hygrophanous,* glabrous, grayish-umber (moist), grayish-brown or cinereous (dry), *margin striatulate when moist.* FLESH thin, whitish or grayish-tinged. GILLS sinuate-adnexed or emarginate, rather broad, *subdistant,* subventricose, white then obscurely grayish-tinged, edge entire. STEM 3-5 cm. long, 2-4 mm. thick, rarely thicker, equal, subpruinose, glabrescent, *shining even,* flexuous, stuffed then hollow, cartilaginous, elastic, whitish. SPORES oblong-ovate, narrow, 7-10 x 4 micr., smooth, white. CYSTIDIA and *sterile cells* lacking. BASIDIA about 27 x 5-6 micr., 4-spored. ODOR strong, *alkaline.* TASTE mild.

Gregarious or subcaespitose. On the ground among leaves, rich frondose woods. Ann Arbor. October-November. Frequent locally.

This species is known by its odor, its finally striate pileus and by its shining stem. It has the appearance and size of a Mycena, but the pileus is soon expanded. It reminds one strongly of *Collybia floccipes,* but the latter has numerous cystidia and no odor, although it grows in similar places.

802. Collybia familia Pk. (Edible)

N. Y. State Cab. Rep. 23, 1872.

Illustrations: N. Y. State Mus. Bull. 75, Pl. 84, 1904.
Marshall, The Mushroom Book, Pl. 16, op. p. 67, 1905.
Plate CLXIII of this Report.

PILEUS 1-3.5 cm. broad, *fragile,* convex or hemispherical, then expanded, *obtuse,* glabrous, hygrophanous, even or margin substriatulate when moist, watery-brownish-buff (moist), *creamy-buff to whitish* (dry), margin at length recurved and split radially. FLESH thin, concolor. GILLS adnexed or almost free, crowded, narrow, whitish, edge entire. STEM 4-8 cm. long, 2-3 mm. thick, *slender,* equal, toughish, stuffed then hollow, glabrous, rarely minutely flocculose, subconfluent at base with mycelioid tomentum, whitish. SPORES subglobose to oval, 3-4.5 x 3 micr., few larger, smooth, white. CYSTIDIA and *sterile cells* none. ODOR and TASTE none.

Densely *caespitose.* On decaying trunks and logs of hemlock and tamarack. Huron Mountains, Marquette, Munising, New Richmond, Ann Arbor. August-October. Infrequent.

Because of their edibility, it is fortunate that the abundant clusters of from ten to twenty individuals are rarely attacked by grubs; these clusters often cover a large part of a log. The species has the general habit of *Collybia abundans* from which it is distinguished by the hygrophanous flesh and by the pileus not being umbilicate nor virgate. The European *Collybia lacerata* Fr. has a similar habit and appearance, but its gills are said to be broad and distant. Peck compares it with *C. acervata,* a caespitose species with very different colors. The Ann Arbor specimens were found on tamarack logs.

***Gills yellow or yellowish.*

803. Collybia aquosa Fr. var. (Edible)

Syst. Myc., 1821.

Illustration: Fries, Icones, Pl. 66, Fig. 2.

PILEUS 2-5 cm. broad, convex at first, soon plane or depressed, distinctly *hygrophanous,* watery-brown or rufous-brown *with a yellow cast* (moist), pale tan to buff (dry), obscurely rugulose, *margin striatulate when moist,* even when dry. FLESH thin, subpliant, whitish, soft. GILLS adnexed or almost free, rounded behind, narrow, crowded, *lutcous or pallid with sulphur tinge,* becoming erose. STEM 5-7 cm. long, 4-6 mm. thick, *equal or subequal,* hollow, subterete or compressed, minutely flocculose-pubescent, even, cuticle cartilaginous, straight or flexuous, *pallid or tinged sulphur-yellow,* especially above, extreme base slightly inflated-bulbous. SPORES 5-6 x 3 micr., narrowly ovate, smooth, white. CYSTIDIA none. ODOR and TASTE mild.

Caespitose. On the ground, among tamaracks or low frondose woods. Ann Arbor. May 20-June.

This is intermediate between *C. dryophila* and *C. aquosa,* but because of its hygrophanous, watery flesh and finely striatulate pileus it seems closer to *C. aquosa.* The plant has a honey-yellow cap and stem, shading its citron or sulphur when fresh and moist, but soon fading. The gills of *C. aquosa* are said to be pallid, in which respect our plant differs somewhat. It forms tufts among grass in drained tamarack swamps or among leaves in low woods. The base of the stem is slightly enlarged, not truly bulbous nor strigose-hairy. It seems to be somewhat related to *C. acervata.* Whether it has been described is uncertain.

804. Collybia colorea Pk.

N. Y. State Mus. Rep. 26, 1874.

"Pileus 1-3 cm. broad, convex-expanded, subumbilicate, *hygrophanous,* glabrous, "luteous"-yellow, not striate, paler when dry. FLESH rather thin, soft, yellowish. GILLS adnexed, emarginate, close, moderately broad, *luteous* to sordid-ochre, edge entire. STEM 2-4 cm. long, 2-4 mm. thick, *equal,* even, subpruinose, hollow, gla-

brous, colored like pileus. SPORES subglobose or broadly elliptical, 4-5 micr."

Scattered or subcaespitose. On decaying wood, especially of pine. Negaunee, New Richmond, Greenville (Longyear). June-September. Rare.

An unidentified Michigan plant approaches this rather closely. It has the same colors, etc., but differs in its fleshy-fibrous, solid stem and bitterish taste. The spores are white.

****Gills rufescent.*

805. Collybia acervata Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 64, Fig. 2.
Gillet, Champignons de France, No. 147.
Cooke, Ill., Pl. 267.
Hard, Mushrooms, Fig. 87, p. 117.
Peck, N. Y. State Mus. Bull. 75, Pl. 84, 1904.

"PILEUS 2-5 cm. broad, convex, becoming expanded or nearly plane, glabrous, *hygrophanous,* pale tan color or incarnate red and sometimes obscurely striatulate on the margin when moist, whitish after the escape of the moisture. GILLS close, rounded behind, slightly adnexed or free, whitish, or slightly tinged pink. STEM 5-7.5 cm. long, 3-5 mm. thick, equal, hollow, slender, rigid but brittle, glabrous except the white-tomentose base, *reddish-brown* or purplish-brown. SPORES elliptic, 6-7.5 x 4 micr., white."

Caespitose. On decaying prostrate trunks and leaves, or on half-buried rotten wood. August-September. Ann Arbor. Infrequent.

The description is obtained from Peck, (N. Y. State Mus. Bull. 75), as my own notes are incomplete. This species may be merely an ecological variety of *C. dryophila.* Like Hard, I have found it in localities formerly occupied by saw-mills. The gills become slightly rufescent in age. Our plant does not seem to agree well with the European descriptions.

806. Collybia hygrophoroides Pk.

N. Y. State Mus. Rep. 32, 1879.

Illustration: Plate CLXIV of this Report.

PILEUS 2-4 cm. broad, *obtusely conical at first* and reddish-brick color, then campanulate to expanded and almost plane, with or without umbo, rufous-tan (moist), dull-tan or isabelline (dry), hygrophanous, glabrous, even, margin straight at first. FLESH thin, whitish. GILLS arcuate-uncinate or deeply emarginate, almost free at times, close, *rather broad,* ventricose, dingy white at first, *then tinged flesh color,* edge becoming eroded. STEM 5-12 cm. long, 2-5 mm. thick, *tough,* often long and twisted, *longitudinally striate* to sulcate, lower third *rooting* and densely white-tomentose, upper part pallid to rufescent and pruinose, stuffed then hollow, curved or straight. SPORES oblong, 5-6.5 x 3-3.5 micr., smooth, white in mass. CYSTIDIA rather abundant on sides of gills, *slender, acuminate above,* 50-60 x 4-5 micr.

Solitary to subcaespitose or scattered. On the ground in low, moist, maple and oak woods. Ann Arbor. May-July. Rare and local; rather common in a single locality.

This is apparently a Mycena as shown by the straight margin of the young pileus. It somewhat resembles Cooke's figure of *M. excisa* (Plate 148), (= M. *berkeleyi* Mass.) which is certainly not the *M. excisa* figured by Fries (Icones). That species, however, grows on trunks of pine, and the color is different from ours according to Fries' description. The young, unopened pileus resembles that of *Hygrophorus conicus* in color and shape, as pointed out by Peck. It seems to have no direct relationship to either Mycena or Collybia. The lower half or third is usually immersed in the soil which adheres to the tomentum when pulled up; this portion may be attenuated or scarcely so as shown in our plate. The older plants have rufescent gills and stem, but the spore-print is white. Our specimens were seen and identified by Peck, who says it is a very rare species.

****Gills lilaceous.*

807. Collybia myriadophylla Pk.

N. Y. State Mus. Rep. 25, 1873.

Illustration: Hard, Mushrooms, Fig. 85, p. 115, 1908.

PILEUS 1.5-2.5 cm. broad, soon plane or depressed, flexible, *hygrophanous,* glabrous, even, sometimes umbilicate or mammilate, *dull umber-brown with lilac tinge* (moist), ochraceous-buff (dry). FLESH very thin. GILLS slightly adnexed, *very crowded, narrow,* linear, thickish, *dark lilac,* edge entire. STEM 2-3 cm. long, 1-1.5 mm. thick, slender, equal, terete or compressed, stuffed by a white pith, then hollow, *dull lilac to reddish-brown,* subglabrous, sometimes densely silky-pruinate. SPORES very minute, 3-4 x 2 micr., elliptic-oval. CYSTIDIA none.

Gregarious. On mossy hemlock or tamarack logs or wood. July to October. Ann Arbor (on tamarack), New Richmond, South Haven, Bay View and Houghton. Infrequent.

A very distinct little Collybia, sometimes lilac-tinged throughout; this color persists longer on the gills than elsewhere. The gills are often glaucous, and on drying become reddish-brown. The stem is sometimes attenuated below and rooting; at times it is entirely white-pruinose with a tuft of lilaceous strigose hairs at the base. The species seems to be limited to coniferous woods.

*****Gills cinerascent or rufescent.*

808. Collybia atrata Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 70, Fig. 1.
Cooke, Ill., Pl. 155.
Gillet, Champignons de France, No. 148.
Hard, Mushrooms, Fig. 83, p. 113, 1908.

"PILEUS 1-2.5 cm. broad, *tough,* plano-depressed, never papillate, convex toward margin, very glabrous, orbicular, umbilicate, *even, pitch-black* and shining (moist), fuscous (dry). FLESH rather thick, firm. GILLS adnate, scarcely decurrent, at first arcuate, then straight, *rather broad, subdistant,* whitish to gray, then fus-

cous. STEM *short,* 2-3 cm. long, 2-4 mm. thick, tough, equal or subequal, *glabrous,* stuffed then hollow, *cartilaginous, fuscous* within and without." SPORES 5-6 x 4 micr., elliptical (Schroeter, W. G. Smith). ODOR *none.*

Around burned stumps or burned over soil, in exposed places.

The above description is taken from Fries' Icones. The occurence of the species in Michigan is somewhat uncertain, as my notes are incomplete. June. Ann Arbor. Infrequent to rare.

A Marasmius-like plant in appearance, but it does not revive. When young and fresh, it seems to be firm, but the thin margin is soon flexible. The gills are not ventricose, and a section through them reveals peculiar hyphae forming the central layer, which are dark colored from blackish-brown granules in their interior; they are not truly ashy, but dark cinnamon-brown when fresh and mature. The base of the stem is sometimes strigose-hairy with fuscous-brown hairs, and under high magnification the rest of the stem is seen to be covered with short, intertwined or spreading dark hairs. On drying the pileus becomes rusty-reddish, or occasionally appears scorched. There are some very similar species and the group needs further study. It is said to occur in autumn.

809. Collybia plexipes Fr. var.

Syst. Myc., 1821.

Illustration: Plate CLXV of this Report.

PILEUS 1-2.5 cm. broad, campanulate-expanded, *obtuse,* glabrous, hygrophanous, *blackish-chestnut* (moist), *rufous when drying,* obscurely rugulose-striatulate when moist, not shining. FLESH concolor, very thin on margin. GILLS slightly adnexed, narrow, tapering outward, thickish, close to crowded, plane, *brown, glaucescent,* edge entire. STEM 3-5 cm. long, 1.5-2.5 mm. thick, subequal, opaque, tubular, *subterete or compressed and furrowed,* flexuous, cartilaginous, often curved, tough, subglabrous, black, paler at apex. SPORES minute, elliptic-ovate, 5-7 x 2.5-3 micr., white, smooth. CYSTIDIA none. ODOR and TASTE none.

Caespitose or subcaespitose to solitary. On very rotten wood, among moss, etc., about old stumps and mounds, in frondose woods.

810. Collybia atratoides Pk.

N. Y. State Rep. 32, 1879.

Illustration: Hard, Mushrooms, Fig. 86, p. 116, 1908.

"PILEUS 1-2 cm. broad, convex, subumbilicate, glabrous, hygrophanous, *blackish-brown (moist)*, grayish-brown and shining (dry). FLESH thin. GILLS adnate, *rather broad, subdistant,* intervenose, grayish-white. STEM 2-3 cm. long, 1-2 mm. thick, equal, hollow, glabrous, grayish-brown, with a mycelioid tomentum at base. SPORES nearly globose, about 5 micr. diameter.

"Gregarious or subcaespitose. On decaying wood and mossy sticks in woods."

The description is adapted from Peck. Hard points out that the margin of the pileus is often crenate. It doubtless occurs within the State, and may be confused with Mycena by its shape and size.

811. Collybia expallens Pk. var.

N. Y. State Mus. Rep. 44, 1891.

PILEUS 1-2.5 cm. broad, orbicular, convex-expanded, depressed or subumbilicate on disk, *hygrophanous, at first blackish,* then brown to pale fuscous, *glabrous, striatulate on margin when* moist. FLESH rather thin, brownish then whitish. GILLS adnate, seceding, medium width, close to subdistant, fuscous, edge entire. STEM 1-2 cm. long, 2-4 mm. thick, tapering downward, tough, hollow, sometimes compressed or grooved, cartilaginous, livid-brown, sometimes blackish on handling, pruinose-pubescent. SPORES subglobose, 5 x 4 micr., smooth, white. CYSTIDIA and STERILE CELLS none. ODOR and TASTE *farinaceous.*

Gregarious among fallen needles of white pine. New Richmond. September. Infrequent.

Differs from *C. atrata* and *C. atratoides* by the presence of a distinct farinaceous odor, and a striate margin to the pileus. It approaches *C. ambusta* except in odor and the lack of a papillate pileus. The stem is pruinose, at least at the apex.

Section II. Laevipedes. Putrescent; not hygrophanous; stem *glabrous, not conspicuously striate.*

812. Collybia albiflavida (Pk.) (Edible)

N. Y. State Mus. Rep. 23, 1872 (as *Tricholoma albiflavidum*).

PILEUS 5-12 cm. broad, convex-expanded, then depressed, obtuse or slightly umbonate, umbo subobsolete and darker, moist, *whitish or creamy-yellow*, even, glabrous, margin at first involute. FLESH white. GILLS adnexed-emarginate, *narrow, crowded,* thin, white or whitish, edge entire. STEM 6-18 cm. long, 5-8 mm. thick, equal above the *bulbous base,* solid, fibrous within, *cuticle cartilaginous,* whitish. SPORES elliptical, smooth, obtuse, 7-10 x 4.5-5.5 micr., white in mass. CYSTIDIA lanceolate, scattered or infrequent on sides of gills, often crystallate at apex, 55-65 x 10-15 micr. ODOR and TASTE none.

Solitary, gregarious or subcaespitose. On the ground in frondose or coniferous woods, among fallen leaves. Throughout the State. June-September. Frequent.

This noble plant is found frequently, especially in moist ravines of most kinds of woods. It was referred by Peck to Tricholoma, where he considered it close to *T. lascivum.* Collectors nearly always mistake it for a Collybia, and this tendency is given a basis because of the presence of cystidia on the gills, and by the nature of the stem, whose rind is cartilaginous. The plant presents a stiff appearance due to the straight and rather rigid-elastic stem. It sometimes attains a much larger size than the original description indicates. A form occurs in low, wet or swampy places, with similar habit and structure, but smaller and darker in color. The color is almost smoky-brown, and the general appearance suggests a form of *Tricholoma melaleucum;* its microscopic details, however, agree with the above species; its pileus is 2.5-5 cm. broad. *T. albiflavidum* has a disagreeable odor at times, but this may disappear, especially after it is picked and left overnight.

813. Collybia abundans Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustration: Plate CLXVI of this Report.

PILEUS 1-3 cm. broad, convex or nearly plane, *subumbilicate,*

whitish or pale grayish-brown, disk darker, *innately-fibrillose,* fibrils more dense on disk, the thin margin at length splitting. FLESH thin. GILLS adnate, rather narrow, close, sometimes veiny, white. STEM 3-5 cm. long, 2 mm. thick, rather short, equal, glabrous, hollow, often curved, easily splitting, concolor or whitish. SPORES subglobose, 5-6 micr. ODOR and TASTE mild.

Caespitose. On decaying wood and logs, in frondose and mixed woods, especially in the north. Ann Arbor, Marquette, Houghton. August-October. Infrequent.

The "abundant Collybia" usually grows in great profusion when it occurs. It is very similar in general appearance to *Collybia familia,* but is usually smaller and shorter-stemmed; its pileus has a slight umbilicus; it is not hygrophanous, and when dried usually becomes rufescent,—a special characteristic of the stem.

814. Collybia succinea Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 65, Fig. 3.
Cooke, Ill., Pl. 151.

PILEUS 1-3 cm. broad, convex-campanulate, subexpanded, smoky rufous-brown, becoming paler, moist, glabrous, even, firm at first then flexible. FLESH becoming whitish, rather thin. GILLS *adnexed, broad,* close to *subdistant,* thickish, ventricose, whitish, edge minutely serrulate. STEM 2-3 cm. long, 1.5-3 mm. thick, equal, *glabrous,* stuffed then hollow, even, cartilaginous, tough, pruinose at apex, *dark rufous-brown.* SPORES oblong, obtuse, 8-9 x 3-3.5 micr., white. CYSTIDIA ventricose, acuminate-pointed above, 45 x 12 micr., abundant on edge of gills, few elsewhere. TASTE and ODOR farinaceous.

Gregarious. On the ground in hemlock-beech woods. New Richmond. September. Infrequent.

The colors are well represented by the illustrations referred to. The farinaceous odor is not mentioned by the European authors, but in other respects the characters of our plants are apparently the same as of those of Europe.

Section III. Striacpedes. Putrescent; not hygrophanous; stem *conspicuously striate;* glabrous.

815. Collybia radicata Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 78, p. 107, 1908.
McIlvaine, One Thousand Amer. Mushrooms, Pl. 29, op. p. 112, 1900.
White, Conn. State Geol. and Nat. Hist. Surv., Bull. No. 3, Pl. 6, op. p. 27, 1905.
Cooke, Ill., Pl. 140.
Gillet, Champignons de France, No. 165.
Peck, N. Y. State Mus. Mem. 4, Pl. 48, 1900.
Plate CLXVII of this Report.

PILEUS 3-10 cm. broad, convex to nearly plane, sometimes umbonate, *viscid,* glabrous, grayish-brown to smoky-brown or umber, sometimes nearly white, even or rugose. FLESH rather thin, white. GILLS *adnexed, broad,* thick, subdistant, white. STEM elongated, 5-20 cm. long above the surface of the ground, with a long root-like prolongation penetrating the earth, tapering upward, 4-8 mm. thick, rigid-erect, *glabrous, twisted-striate* to sulcate, white above, usually brownish or smoky-brownish elsewhere, cartilaginous. SPORES broadly elliptical, smooth, 14-17 x 9-11 micr. CYSTIDIA scattered, on edge and sides of gills, 60-80 x 15-18 micr. ODOR and TASTE mild.

Gregarious or solitary. On the ground in woods, groves, clearings, etc., throughout the State. June-October. (Earliest record June 26, latest October 4.) Common.

The "rooted Collybia" is closely related to *C. longipes,* whose stem has a similar root-like prolongation at the base. The viscidity of the pileus is almost absent in dry weather. The stem is usually thickened just above the "root," and as Atkinson has pointed out, this "root" is sometimes attached to dead tree roots deep in the soil. They often grow from much decayed stumps or logs, especially in recent clearings. The clear white of the gills is quite marked. It is one of the first summer mushrooms with which the beginner becomes acquainted, and the great variation in color and size will often mislead him into thinking he has several kinds, especially if he collects without getting the "root." Peck has named two varie-

ties: Var. *furfuracea:* (Ill., Peck, N. Y. State Mus. Mem. 4, Plate 48, Fig. 9-11). STEM *minutely scurfy.* This variety, therefore, differs mainly from *C. longipes* in viscid cap and spores. Var. *pusilla:* (Ill., Peck, N. Y. State Mus. Mem. 4, Plate 48, Fig. 12-14). Cap 1-3 cm. broad, otherwise like the typical form. All of these are edible.

816. Collybia platyphylla Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Marshall, The Mushroom Book, Pl. 15, op. p. 66, 1905.
Hard, Mushrooms, Fig. 79, p. 109, 1908.
White, Conn. State Survey Bull. 15, Pl. 7, 1910.
Peck, N. Y. State Mus. Mem. 4, Pl. 49, 1900.
Michael, Führer f. Pilzfreunde, Vol. III, No. 106.
Fries, Icones, Pl. 61.
Cooke, Ill., Pl. 128.

PILEUS 6-12 cm. broad, at first ovate-campanulate, then convex-expanded, obtuse or depressed, grayish-brown to whitish-gray, *streaked with darker fibrils* or innate scurfy scales, often wavy on margin. FLESH thin, fragile, scissile, white. GILLS adnexed, deeply emarginate, *broad,* subdistant, often transversely striate and splitting, edge entire or eroded, white. STEM 7-12 cm. long, *stout,* 1-2 cm. thick, *fibrous-fleshy,* cuticle subcartilaginous, equal, fibrous-solid becoming cavernous, *fibrillose-striate,* white or whitish, base blunt or attached to thick strands of mycelium. SPORES broadly elliptical, smooth, 8-10 x 6-7 micr., white. (Immature spores abundant in mounts.) CYSTIDIA none. STERILE CELLS on edge of gills, inflated-rounded, 25 x 13 micr. ODOR mild, slightly of anise. TASTE slightly unpleasant when fresh, disagreeable when old.

Solitary, gregarious or subcaespitose. On decaying wood, stumps, humus, etc., in frondose woods, throughout the State after heavy rains. June-October. (Earliest record June 15, latest October 4.)

This species is our largest Collybia although *C. radicata* sometimes has a cap equal in width. The fleshy, scarcely cartilaginous, consistency of its stem may lead one to refer it to the genus Tricholoma. Peck and others say the stem is stuffed or hollow. I have found the young stem solid-fibrous, later tunneled by grubs, and the interior loosened. Insects attack the plant readily and spoil it for use on the table, but as it does not rank very high in flavor,

this is of little consequence. Stevenson has incorrectly given the spore measurements as 19 x 13 micr., and McIlvaine has copied the error.

817. Collybia maculata A. & S. (Edible)

Syst. Myc., 1821.

Illustrations: Marshall, The Mushroom Book, Pl. 15, op. p. 66, 1905.
Hard, Mushrooms, Fig. 82, p. 113, 1908.
Murrill, Mycologia, Vol. 6, Pl. 130.

PILEUS 5-15 cm. broad, *compact,* convex then expanded, obtuse or broadly subumbonate, *glabrous,* even, *white with ferruginous* stains or spots, later becoming rusty-red throughout, margin at first inrolled, then waxy or lobed. FLESH white, firm. GILLS adnexed, or nearly free, *very narrow, crowded,* white or whitish, edge entire. STEM 6-16 cm. long, 6-12 mm. thick, equal or subventricose, *attenuated below* and praemorsely rooting, *firm, cartilaginous, striate* or subsulcate, hollow. SPORES subglobose to short-elliptical, 6 x 3-4 micr., smooth, white. CYSTIDIA none.

Solitary or subcaespitose. On the ground, conifer or mixed woods of northern Michigan. Isle Royale, Marquette, Houghton, Bay View. July-September. Infrequent.

The firm, compact flesh, the narrow crowded gills and stained pileus characterize this plant. The pileus is often narrow compared with the long and rather stout stem. With age the stains spread and the whole plant becomes reddish. Specimens were found in frondose woods of southern Michigan which approach *C. szorconerea* Batsch. with cream-colored to ochroleucous gills, and bitterish taste; the spores of this form measured 6 x 3 micr. The pileus was rufous-tinged or darker on disk. *Tricholoma submaculatum* Pk. has smaller spores and a solid stem; otherwise it seems to approach some of the variations of *Collybia maculata.*

Section IV. Vestipedes. Putrescent; stem *velvety, fibrillose* hairy, *floccose* or *pruinose.*

818. Collybia velutipes Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Pl. 15, p. 119, 1908.
Reddick, Dept. of Geol. & Nat. Resources of Indiana, Rep. 32, 1907, Fig. 10.
Peck, N. Y. State Mus. Mem. 4, Pl. 47, 1900.
Cooke, Ill., Pl. 184.
Gillet, Champignons de France, No. 169.
Murrill, Mycologia, Vol. 1, Pl. 3, Fig. 6.
Michael, Führer f. Pilzfreunde, Vol. II, No. 82.
Plate CLXVIII of this Report.

PILEUS 2-5 cm. broad, convex-expanded, *viscid,* obtuse, glabrous, the viscid pellicle separable, tawny, *reddish-yellow,* usually darker on disk and yellowish on margin, even, margin often irregular. FLESH rather thickish, white or tinged reddish-yellow. GILLS adnexed, emarginate, broad, subdistant to close, whitish or yellowish, edge minutely fimbriate. STEM 2-7 cm. long, 3-6 mm. thick, firm, stuffed, then hollow, *densely velvety with short, tawny or blackish-brown hairs,* yellow at apex, *tough,* short-radicating. SPORES oblong, smooth, 7-9 x 3-4 micr. (rarely longer), white in mass. CYSTIDIA none. STERILE CELLS on edge of gills, slender, awl-shaped. ODOR and TASTE mild.

Caespitose. On decaying stumps, logs, roots, etc., as well as on bark of living trees; throughout the State. Most abundant in autumn, in September to December, occurring, however, occasionally any time during the year. In winter it may be found during warm weather, almost surrounded by ice, seeming *to revive* at each warm period. As soon as the snow is gone fresh specimens, which have developed at the first touch of the warm spring sunshine, may be found.

The viscid, reddish-yellow pileus and dark velvety stem are characters by which it is easily known. It may appear to grow from the ground, but in such cases the "root" is usually attached to dead woody matter below the surface. Specimens which had no pileus, and were composed only of a stem, several feet long, were found in the Calumet mine almost a mile beneath the surface of the ground; the characteristic blackish-brown velvety covering on the

lower portion indicated that it was clearly a monstrous form of this species; it was growing on the mine timbers. Whether it is truly parasitic on living trees has not been satisfactorily proven. When preparing it for table use, it is best to peel off the viscous pellicle of the cap.

819. Collybia longipes Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 201.
Gillet, Champignons de France, No. 160.

"PILEUS 3-5 cm. broad, convex-expanded, subumbonate, *dry,* radiate-wrinkled, clear brown, disk darker, *densely velvety with short brown hairs.* FLESH thin. GILLS almost free, rather broad, subdistant, ventricose, *pure white,* edge fimbriate. STEM 8-12 cm. long, 4-5 mm. thick, solid, firm, straight, thicker below, the base prolongated into an oblique "root," white within, leather-brown to chestnut-brown, pale above, *covered with spreading, tomentose, brown hairs.* SPORES broadly elliptical, 9-10 x 6-7 micr., smooth, white. CYSTIDIA large, flask-shaped, 55 x 17 micr., scattered on sides and edge of gills."

On decayed wood, stumps and logs.

Not with certainty found within the State. The description is adopted from Schroeter, as my notes are incomplete. The plant has much the appearance of *C. radicata,* but the pileus is dry and velvety. McIlvaine reports it in West Virginia, but his remark that "it is more glutinous" than *C. radicata* eliminates his claim. It is included for purposes of comparison.

820. Collybia succosa Pk.

N. Y. State Mus. Rep. 25, 1873.

PILEUS 1-3 cm. broad, subcartilaginous, campanulate to convex, *cinereous-brown to fuliginous, minutely pubescent,* margin incurved and surpassing the gills. FLESH thickish, white at first, *becoming purplish-black where wounded.* GILLS adnate with a slight decurrent tooth, becoming emarginate, moderately broad, tapering in front, close, whitish, *turning blackish where bruised.* Stem 2-5 cm. long, 2 mm. thick, equal, cartilaginous, compact except the stuffed axis, often curved, *clothed with a fine, fuliginous pubescence,*

becoming blackish. SPORES minute, globose-ovoid, 3-4 micr. in diameter, smooth, white. CYSTIDIA none; *sterile cells* on edge of gills, abundant, slender, subfiliform. ODOR and TASTE not marked.

Scattered or caespitose. On decayed wood, logs, etc., mostly on hemlock, in coniferous regions. Marquette, Munising, South Haven, New Richmond. July-September.

Easily distinguished by the change of color when bruised. This change is due to lactiferous tubes containing a juice which turns blackish on exposure to the air. These tubes are specialized hyphae interspersed throughout the trama of the pileus, gills and stem. Under the microscope it may be seen that the pubescence is composed of elongated hyaline cells. The presence of a juice which exudes on wounding the plant is unusual in this genus, and reminds one of a section of the genus Mycena; but the incurved margin of the young pileus indicates its relationship with Collybia.

821. Collybia floccipes Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 1168.
Plate CLXIX of this Report.

PILEUS small, 5-20 mm. broad, conic-campanulate, subexpanded to almost plane, *papillate, grayish-brown to sooty-brown*, almost blackish on umbo, glabrous, faintly striatulate and shining when moist, margin at first incurved. FLESH thin, whitish except cuticle, which is composed of erect, vesiculose cells. GILLS narrowly adnexed, medium broad, close to subdistant, subventricose, *white*, edge pulverulent-fimbriate. STEM 3-5 cm. (sometimes up to 10 cm.) long, flaccid, filiform, 5-2 mm. thick, often rooting, *toughish*, equal, flexuous, even, hollow, white, *minutely dotted under lens, with subcolorous to blackish points*, base with white spreading fibrils. SPORES subglobose, prominently apiculate, 5-6 x 4-5 micr. (with apiculus 1 micr. longer), smooth, white. CYSTIDIA *abundant*, on edge and sides of gills, narrowly lanceolate, 60-90 x 7-11 micr., subobtuse at apex. ODOR and TASTE *none*.

Gregarious, scattered or subcaespitose. On humus, decayed leaves, very rotten wood, etc., in frondose woods. Ann Arbor. May-June. Frequent locally.

This species has the appearance of a Mycena, but the pileus has an incurved margin. A lens is often necessary to detect the minute

brownish points on the stem, at other times they are easily visible. These points are due to short, microscopic, dark, cystidia-like hairs. Otherwise the stem is shining and whitish. When growing on much decayed wood the stem may be long, deeply rooting; when on the ground it is scarcely more than attached by the spreading white hairs and is shorter. In size *C. floccipes* reminds one somewhat of *C. alcalinolens* and it grows in similar places, but it has no odor and is not hygrophanous.

822. Collybia conigenoides Ellis

Torr. Bot. Club Bull., Vol. 6.

PILEUS small, 1-5 mm. broad, *convex* then plane, pellucid-striate, dingy cream-colored or tinged tan, *covered by a minute pubescence* (under a lens). FLESH thin, white. GILLS slightly adnexed or free, close to subdistant, medium broad, whitish, becoming yellowish, edge minutely pubescent. STEM filiform, 2-3 cm. long, delicate, minutely pubescent under a lens, attached at base by small rooting white hairs, white. SPORES minute, oblong, smooth, 4-5 x 2-3 micr., white. CYSTIDIA mostly on edge of gills, lanceolate, 25-35 micr. long.

On half-buried cones of white pine. New Richmond. September. Rare.

Peck has described a similar species growing on cones, which he called *C. albipilata*. It has the same kind of spores and cystidia as our species. It is said to be larger with an 8-12 mm. pileus which is brown. In other respects *C. albipilata* is like *C. conigenoides*. I suspect *C. albipilata* is merely a luxuriant form. Cystidia are apt to vary somewhat in large and small plants. Two European species which grow on pine cones have been critically discussed by Bresadola. They are *C. esculenta* and *C. conigena*. Their spores measure 6-8 x 3-4 micr., and hence our plant cannot be referred to them. Their size is also markedly different, the pilei being 1-3 cm. across. Their stems are long, creeping and rooting, and are covered on the rooting portion with a fibrillose tomentum.

823. Collybia tuberosa Fr.

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde, Vol. II, No. 80.
Gillett, Champignons de France, No. 168.
Cooke, Ill., Pl. 144.

PILEUS *small,* 5-10 mm. broad, convex or nearly plane, obtuse or subumbonate, even, glabrous or nearly so, *whitish, often tinged reddish or yellowish.* FLESH thin, white. GILLS adnate, thin, close, whitish, edge minutely pubescent. STEM slender, 2-4 mm. long, 1 mm. thick, flaccid, hollow, whitish or reddish-tinged, covered by a thin white cortinoid pulverulence, often nearly glabrous above, *arising from a reddish-brown or blackish, small sclerotium.* SCLEROTIUM 2-5 cm. long, 1-2 mm. wide, variable in shape. SPORES elliptical, 4-5.5 x 2-3 micr., smooth, white.

Gregarious or crowded. On the remains of decayed Agarics or damp humus. Throughout the State. July-September. Frequent.

The tuber-bearing Collybia is usually aggregated in numbers on the blackened remains of some mushroom, in which the small, tuber-like sclerotia are imbedded. Occasionally, however, it appears to develop on much decayed leaf-humus on the ground. It resembles *C. cirrata* in color and size.

824. Collybia cirrata Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 144.
Gillet, Champignons de France, No. 150.

PILEUS 5-12 mm. broad, soon plane or slightly depressed, *at length umbilicate,* sometimes papillate, *slightly silky,* toughish, white or tinged reddish. FLESH thin, white. GILLS adnate, *narrow,* close, whitish. STEM 2-5 cm. long, filiform, equal, somewhat hollow, flexuous, pallid, *covered by a white pulverulence,* with a fibrillose, radicating base. SPORES minute, elliptical, smooth, 4-5 x 2-3 micr.

Decaying vegetable matter in woods, throughout the State. July-September. Infrequent.

This little Collybia is closely related to *C. tuberosa.* Authors differ with reference to the presence or absence of a sclerotium.

Schroeter (Die Pilze Schliesiens, p. 645) describes a small yellowish sclerotium from which the stem arises, and which he says forms abundantly between the gills of decaying fungi, especially *Hypholoma fasciculare*. Berkeley also notes that it is "often attached to a little, yellowish, nodular schlerotium." Stevenson remarks that "it never has a radical tuber." Fries, Gillet and others do not mention a sclerotium; I have not observed any. Most authors agree that it occurs on decaying mushrooms, as well as humus, etc. It differs from *C. tuberosa* in its umbilicate pileus.

825. Collybia hariolorum Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 150.
Gillet, Champignons de France, No. 159.

PILEUS 2-5 cm. broad, broadly convex-expanded, thin, flexible, *becoming soft and flabby in moist weather,* even, glabrous, *whitish with a rufescent disk* or altogether rufous-tinged, often fading to pallid-whitish; flesh thin, white, *soft.* GILLS adnexed or almost free, *very narrow, crowded,* hollow, thickish, edge entire, collapsing. STEM 2-5 cm. long, 2-3 mm. thick, equal or tapering slightly upward, pallid or tinged rufescent, *covered by a white tomentum* which is thinner towards apex, hollow, elastic, cartilaginous, becoming soft when wet. SPORES small, 6-7.5 x 3 micr., narrowly oblong-ovate, smooth, white. CYSTIDIA none. ODOR strong and somewhat disagreeable when plants are crushed.

Gregarious, often scattered, sometimes caespitose. Among fallen leaves in frondose woods, probably throughout the State. August-September. Rather frequent.

This Collybia may be known by its soft and somewhat collapsible texture, the white tomentosity of the stem, and the pale rufous-white or whitish cap. It has somewhat the appearance of *C. confluens* to which it seems related, but as a rule it has a shorter stem, and in wet weather, instead of reviving becomes soft and fragile. The figure of Cooke illustrates our plant fairly well. The rufous tinge of the pileus is apparently more characteristic of American than of European plants.

Section V. Marasmioidae. Plants partially or wholly reviving (not truly putrescent). Hygrophanous or dry. Stem pulverulent, floccose, fibrillose-hairy or floccose-hairy.

The species placed under this new section have anomalous characters which ally them equally with the genus Marasmius. In fact this section and the section Collybiae under Marasmius contain species which intergrade between the two genera, and hard and fast lines of separation are impracticable. *Marasmius oreades* might be included here, as its flesh is more like Collybia than Marasmius. *C. confluens* is an equally good Marasmius.

826. Collybia confluens Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 84, p. 114, 1908.
Cooke, Ill., Pl. 150.
Gillet, Champignons de France, No. 153.

PILEUS 2-5 cm. broad, tough, flaccid, convex-plane, obtuse, *hygrophanous*, reddish-brown (moist), grayish-flesh-colored to whitish (dry), subumbonate, striatulate when moist. FLESH rather thin toward stem, almost as thick as width of gills, white. GILLS free, *narrow, very crowded,* whitish. STEM 5-10 cm. (or more) long, 2-5 mm. thick, subequal, hollow and often compressed, subcartilaginous, tough, *reddish under the dense, whitish pubescence,* even, sometimes grooved, often joined at base by a floccose myceliod web which spreads among the leaves on which it grows. SPORES minute, narrowly pip-shaped, 4-6 x 3-4 micr., white. CYSTIDIA none. STERILE CELLS on edge of gills small. ODOR and TASTE mild or slightly unpleasant.

Coherent in tufts, or gregarious in troops or part-rings. Among fallen leaves on the ground. Throughout the State. July-October. Common.

The colors of the young and old pilei vary considerably; when young they may be almost bay-red, later becoming reddish-brown to grayish or white. The stem is rather long in proportion to the pileus. The species is most common in frondose woods, where its mycelium forms a whitish mould over and among the fallen leaves.

827. Collybia zonata Pk.

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Hard, Mushrooms, Pl. 14, Fig. 81, p. 111, 1908.
White, Conn. State Surv. Bull. 15, Pl. 9, 1910.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 8 (as *Collybidium zonatum*).
Lloyd, Mycological Notes, Vol. I, No. 5, Fig. 17, p. 43.

PILEUS 1-2.5 cm. broad, convex or nearly plane, *umbilicate, covered with coarse, tawny, densely matted hairs, arranged in obscure zones.* GILLS free, close, narrow, white. STEM 2-5 cm. long, about 2 mm. thick, firm, equal, hollow, covered with tawny hairs similar to those of the pileus. SPORES broadly elliptical, smooth, 5 x 4 micr., white.

Solitary or subcaespitose. On decaying wood. New Richmond. August-September. Infrequent or rare.

The dark tawny color, the zones on the pileus and the fibrillose-hairy covering of cap and stem distinguish our plant. It revives after drying. When dry the pileus becomes concentrically grooved. Some think it is a large variety of *C. stipitaria,* but as it is easily distinguished from that species, such a view is speculative. To prove this point, it would be necessary to grow one form from spores or tissue derived from the other. This has not been done.

828. Collybia stipitaria Fr.

Syst. Myc., 1821.

Illustrations: Lloyd, Mycological Notes, Vol. I, No. 5, Fig. 15, p. 42.
Berkeley, Outlines, Pl. 5, Fig. 6.
Cooke, Ill., Pl. 149.

PILEUS *small,* 5-12 mm. broad, convex-expanded to plane, *umbilicate, with a minute blackish papilla* in umbilicus, whitish, grayish or pale grayish-tawny, *minutely and radiately fibrillose-hairy* or strigose-hairy, radiate-rugulose when dry. FLESH thin, submembranous, soft. GILLS adnexed-seceding, subdistant to close, narrow, white. STEM 2-5 cm. long, filiform, .5-1 mm. thick, equal, *reddish-black when moist, whitish when dry,* tough, cartilaginous, tubular, *instititious,* clothed with a grayish-white fibrillose cover-

ing when dry, sometimes twisted-striate. SPORES elliptic-ovate, pointed at one end, smooth, white, 6-8 x 3-4 micr. Odor none.

Gregarious. On twigs, wood, acorns, etc., in mixed or frondose woods. Throughout the State. Frequent and abundant. June-October.

The pileus of this fine little plant has a delicate circular ridge around the papillate umbilicus. The color of the stem changes markedly; when thrown into water it becomes reddish to blackish, on drying the fibrillose covering becomes pale gray or whitish. The margin of pileus is often fimbriate from the minute strigose hairs. Peck has named a long-stemmed form var. *setipes*. This was found in northern Michigan on several occasions.

829. Collybia campanella Pk.

N. Y. State Mus. Bull. 116, 1907.

Illustration: Lloyd, Myc. Notes, Vol. I, No. 5, Fig. 16 (probably as *C. stipitaria* var. *robusta*).

"PILEUS 6-8 mm. broad, *conical or campanulate* with a papilla at the apex, covered with coarse appressed or deflexed strigose hairs, dark tawny. GILLS ascending, moderately close, whitish. STEM 2-3 cm. long, 1 mm. thick, *instititious,* firm, equal, floccose-hairy, colored like the pileus." Spores elliptic-oval, smooth, 7-8 x 3-4 micr., white.

Gregarious. On dead and dry twigs of arbor vitae. Houghton. August.

My specimens were identified by Peck, whose description is reproduced. The plant has the appearance, like all of this section, of a Marasmius. It differs from *C. stipitaria* in its persistent conic-campanulate cap, a character retained when dried. The dark tawny color also remains uniform on the cap and stem of the dried specimens. The floccose-strigose covering of the stem is thick and concolorous. Its habitat seems to be exclusively on cedar twigs.

830. Collybia lacunosa Pk.

N. Y. State Mus. Rep. 26, 1874 (as Tricholoma).

PILEUS 8-15 mm. broad, convex then expanded, dry, *lacunose*, densely furfuraceous, sometimes sulcate-striate to rugose, *sulphur-yellow to golden-yellow*. GILLS adnate to subdecurrent, rather

broad, *distant,* thick, sometimes *intervenose,* white, edge pruinose. STEM 2-5 cm. long, about 2 mm. thick, firm, *tough,* solid, equal, instititious, *floccose-scaly or furfuraceous,* sulphur or pallid-yellow. SPORES broadly-oval, or subglobose, granular-punctate, 8-10 x 6-7 micr. STERILE CELLS on edge of gills, subcylindrical, rounded-subcapitate, about 45-50 x 9 micr.

Solitary or scattered. On fallen branches and decaying wood, in mixed woods of coniferous regions. Marquette, Bay View, New Richmond. August-September.

The attractive color, the tough texture, furfuraceous to floccose covering of cap and stem distinguish this species easily from all other Collybias. The plant has occasionally been wrongly identified as *Lentinus chrysopeplos* B. & C. Its texture is doubtless very similar to Lentinus and Panus, but it lacks the arid gills of those genera. The description of *Omphalia scabriuscula* Pk. also fits our plant rather closely, but if it were that species it would be far removed from *Omphalia umbellifera* to which Peck attached *O. scabriuscula* as a variety. The gills have a tendency to become decurrent, and if referred to the genus Omphalia the plant would become *O. lacunosa.* In many respects it is an anomalous mushroom, half-way between Omphalia, Collybia and Panus.

Mycena Fr.

(From the Greek, *mykes,* a fungus.)

White-spored. Stem *cartilaginous,* slender, hollow. Pileus thin, conic or sub-cylindrical at first, then *campanulate, margin at first straight and applied to stem.* Gills adnexed or adnate, *not decurrent,* sometimes uncinate.

Epiphytal, lignicolous or terrestrial, putrescent, small or minute plants; separated from Collybia by the unexpanded, bell-shaped pileus; from Omphalia by the non-decurrent gills; and from Marasmius by their non-reviving consistency. The genus is a large one. Many species are probably edible, but because of their small size most of them yield very little substance. Peck (N. Y. State Mus. Bull. 167, 1913) reports *M. splendidipes* Pk. as poisonous. They correspond to Nolanea of the pink-spored group, and Galera of the ochre-spored group. The genus is of great interest scientifically.

The PILEUS is either conical at first, or parabolic-cylindrical, or ovate. On opening it usually remains campanulate, except in a comparatively small number of species in which it often develops a mark-

ed umbo. In certain species like *M. pelianthina, M. pura, M. cohaerens, M. galericulata,* etc., the mature pileus usually expands like that of Collybia, and the margin may even become recurved; this is more often true of the larger species. The tendency however for the pileus to remain conical or conic-campanulate for quite a time is due to the position of the margin of the young cap on the stem; the growth-tensions in such cases do not easily raise the margin outward, except in the more fleshy and larger caps. The caps may be very fragile or quite tough, usually very thin or membranous in the smaller species. The *trama* of the mature pileus is composed of large, vesiculose cells with a more or less differentiated cuticle of various structures. The color of the caps is often very delicate, red, blue, yellow, brown, gray and white being found in the various shades and tints. The surface is usually glabrous and striatulate on the margin. The GILLS are adnexed or adnate, sometimes running down the stem by a short tooth, and in *M. vulgaris* becoming somewhat decurrent as the pileus expands. In some species they are pure white, in others they become slightly ashy or flesh color in age, and in a few cases, like *M. leajana* and *M. pelianthina,* are brightly colored. There are CYSTIDIA present in a number of species. In one group (Calodontes) these are colored and hence the edges of the gills where they occur have the corresponding color. In others the cystidia are hyaline or colorless. They may be very numerous on both sides and edges as in *M. cohaerens* and *M. leajana,* in which species they give the color to the entire surface of the gills; in *M. atroalboides, M. dissiliens* and *M. polygramma* var. *albidus,* they are hyaline. In some the cystidia are found only on the edge and are then referred to as *sterile cells,* especially if of different shape from the others, e. g., *M. alkalina, M. polygramma* and *M. metatus.* In these species the shape of the cystidia varies considerably—they may be flask-shaped, lanceolate, pear-shaped, sac-shaped, or hair-like. In some species no cystidia, or only a few scattered ones occur; e. g., *M. galericulata, M. pura* and *M. epipterygia.* It is an open question whether the numbers or shapes do not vary to a considerable extent in a species. The STEM in each of the different groups has quite distinct characters, and these are the most convenient means of distinguishing the species. Some stems exude a colored juice, others are viscous; the base is sometimes attached by a disk, and at other times it penetrates the substratum by a hairy, root-like extension. It may be firm, fragile or flaccid. The interior is mostly tubular, and the rind is cartilaginous. The surface may be glabrous,

horny and shining, or dull opaque and pruinose or hairy. It is delicate and filiform in the smaller forms. The SPORES with very few exceptions are smooth. It seems to be a marked characteristic of this genus, that the immature spores are easily loosened when sections of the gills are mounted in water. The result is that abundant immature spores are present in a mount, and great care must be taken to get the measurements from mature spores. The immature spores are usually delicately punctate-granular or irregular in shape but practice will soon make the observer properly discriminating. The spores of different species vary from spherical to oval or elliptical, and are white when deposited in a mass. In *M. lasiosperma* the spores are rough with short knobs. The ODOR of some species is alkaline or *nitrous*, sometimes of radish, and when collecting it is well to test the fresh plant, since the odor may disappear. If the plants are kept in a tight box till one gets home, the odor is often very marked on opening the box. Omission to test for the odor may make it difficult to identify the plant correctly.

Mycenas may be found from early spring until the late autumn. They are usually gregarious or caespitose, and the wood-inhabiting species often form dense clusters of individuals. Many are quite small, and are hidden among leaves, sticks and grass. The caps of others reach a size of one or two inches.

The genus was divided by Fries (in Hymen. Europ.) into nine sections, largely with reference to the characters of the stem. These divisions have been found so fundamental and satisfactory that most later mycologists have followed the Friesian arrangement. The nine sections are characterized in the key, and in the text following.

Key to the Species

I. Stem with a colored or milky juice, (Lactipedes) (A).
I. Stem without colored juice, II.
II. Stem viscous, (Glutinipedes) (B).
II. Stem not viscous, III.
III. Base of stem dilated into a disk or bulb; pileus white or delicately tinted, 4-10 mm. broad, (Basipedes) (C).
III. Base of stem not with abrupt bulb or disk, IV.
IV. Edge of gills darker-colored from colored cystidia, (Calodontes) (D).
IV. Edge of gills not of a different color, V.
V. Stem inserted by the naked base on the wood, leaves, etc., from which it grows, (Insititiae) (E).
V. Stem attached by a villose or fibrilose more or less rooting base, VI.
VI. Gills remaining clear white; mostly on the ground; pileus rarely above 1 cm. broad, white or brightly colored, (Adonidae) (F).
VI. Gills tending to ashy, fuscous or flesh tints in age, VII.

VII. Stem firm, rigid; mostly on wood and usually caespitose, (Rigipedes) (G).
VII. Stem not markedly firm or rigid, VIII.
VIII. Stem fragile, slender; pileus hygrophanous; plants often odorous, (Fragilipedes) (H).
VIII. Stem flaccid, filiform; pileus not hygrophanous; on the ground, mosses, mossy logs, etc., (Filipedes) (I).

(A) LACTIPEDES

(a) Edge of gills deeply colored, provided with red to dark-purple cystidia; juice dull red. 832. *M. sanguinolenta* A. & S.
(aa) Edge of gills not differently colored. Juice reddish; margin of pileus crenate; pileus and gills soon stained. 831. *M. haematopa* Fr.

(B) GLUTINIPEDES

(a) Pileus and stem both with a more or less viscid thin pellicle.
(b) Pileus, stem and gills bright orange-yellow; caespitose; pileus 2-4 cm. broad. 833. *M. leajana* Berk.
(bb) Colored differently, smaller.
(c) Gills at length decurrent; pileus convex, umbilicate, 4-10 mm. 834. *M. vulgaris* Fr.
(cc) Gills at most with decurrent tooth; pileus conic-campanulate, obtuse.
(d) Stem slender, 0.5-1 mm. thick, elongated.
(e) Stem yellowish; spores 8-10 x 4-5 micr. 835. *M. epipterygia* Fr.
(ee) Stem brownish; spores broader, 8-9 x 5-6 micr. 835. *M. epipterygia* var. B.
(dd) Stem yellowish, 1.5-2 mm. thick, not long; spores 9-10 x 6-6.5 micr.
(aa) Pileus without a viscid pellicle; stem viscid, slender.
(b) Pileus, stem and gills white; spores 7-9 x 5 micr. 836. *M. clavicularis* Fr. var. *alba.*
(bb) Pileus, stem and gills yellowish; spores 11-12 x 7-8 micr. 836. *M. clavicularis* var. *luteipes.*

(C) BASIPEDES

(a) Base of stem attached by a flat, orbicular disk to fallen leaves, twigs, etc; gills free. 837. *M. stylobates* Fr.
(aa) Base of stem attached by white radiating hairs, forming a floccose bulblet.
(b) Pileus and stem beset with minute glandular particles; gills close. 838. *M. crystallina* Pk.
(bb) Pileus glabrous, pellucid-striate; gills distant, thick. 839. *M. echinipes* Fr.

(D) CALODONTES

(a) Pileus 2-6 cm. broad, at length fully expanded; gills violet to brown; stem 3-5 mm. thick. 840. *M. pelianthina* Fr.
(aa) Pileus conic-campanulate, less then 2 cm.; stem filiform.
(b) Pileus and stem violet, rosy or purple-tinged, becoming paler; pileus striatulate.
(c) Gills tinged flesh color, edge deeper-colored; spores oblong-elliptic. 841. *M. rosella* Fr.
(cc) Gills white, edge purplish; spores subglobose. 842. *M. purpureofusca* Pk.
(bb) Pileus livid-gray, grayish-brown or dark-brown; edge of gills purplish-brown.

(c) Pileus striate (moist), hygrophanous; stem fragile. *M. capillaripes* Pk.
(cc) Pileus not striate nor hygrophanous; stem toughish. 843. *M. denticulata* Pk.

(E) INSTITITIAE

(a) On the bark of living tree trunks; common on shade trees; gills broad. 844. *M. corticola* Fr.
(aa) On fallen leaves in woods; stem hairy; gills narrow. 845. *M. setosa* Fr.

(F) ADONIDAE

(a) Pileus 2-5 cm. broad, thick, rose color to pale lilac; odor of radish. 846. *M. pura* Fr.
(aa) Pileus usually less than 2 cm. broad. Pileus, stem and gills entirely white; small; gills rather broad, subdistant.
(b) Stem at first minutely-pulverulent; pileus papillate on disk. 847. *M. minutula* Pk.
(bb) Stem glabrous, pellucid; pileus not papillate. 848. *M. immaculata* Pk.

(G) RIGIPEDES

(a) Pileus bluish at first, 5-12 mm. broad; stem grayish-brown. 855. *M. cyaneobasis* Pk.
(aa) Pileus not bluish, larger, 1-4 cm. broad.
(b) Gills brown from the brown cystidia; stem horny, shining, dark brown. (See 46. *Marasmius cohaerens*).
(bb) Gills not deep brown.
(c) Gills assuming an incarnate tinge in age; stems rufous-brown downwards; odor and cystidia lacking. 849. *M. galericulata* Fr.
(cc) Gills usually cinerascent in age.
(d) Pileus some shade of gray or almost white.
(e) Odor nitrous; cystidia abundant on sides of gills; pileus white to pearl-gray. 853. *M. polygramma* Fr. var. *albida* Kauff.
(ee) Odor not nitrous.
(f) Pileus 1-3 cm. broad, dark ashy to pearl-gray; cystidia few; gills not with decurrent tooth. 852. *M. parabolica* Fr.
(ff) Pileus 0.5-2 cm. broad, dark ashy;gills uncinate; spores tubercular-rough. 854. *M. lasiosperma* Bres.
(dd) Pileus dark fuscous or dark brown, 2-4 cm.
(e) Gills subdistant, with cystidia, rather broad but narrowly adnexed. 851. *M. excisa* Fr.
(ee) Gills crowded, narrow; whole plant brownish-fucescent, dark. 850. *M. inclinata* Fr. var.

(H) FRAGILIPEDES

(a) Odor alkaline or nitrous in fresh plants.
(b) Stem lubricous; spores symmetrically elliptical; pileus grayish-brown to grayish-umber (moist). 856. *M. alcalina* Fr.
(bb) Stem not lubricous; usually gregarious, not very caespitose.
(c) Pileus glaucous-pruinose when dry, soon grayish-white; gills not decurrent by tooth. 859. *M. leptocephala* Fr.
(cc) Pileus not glaucous.
(d) Gills adnate with tooth; odor strong; pileus dark fuscous-gray (moist). 857. *M. ammoniaca* Fr.

(dd) Gills not uncinate; odor weak, evanescent; among mosses and grasses in wet places. 858. *M. metata* Fr.
(ddd) Cystidia abundant on sides of gills. (Not identified).
(aa) Without nitrous or alkaline odor.
(b) Cystidia numerous on sides of gills; pileus 5-15 mm. broad.
(c) Pileus tending to convex, brownish to umber (moist); stem white. 860. *M. dissiliens* Fr. var.
(cc) Pileus conic-campanulate, fuscous-cinereous; young stem and pileus bluish-blackish-gray. 862. *M. atroalboides* Pk.
(bb) Cystidia none on sides of gills.
(c) Pileus 1-2.5 cm., with smoky-fuscous umbo; stem 1.5-2.5 mm. thick, short. 861. *M. atroalba* Fr.
(cc) Pileus 5-15 mm., conic-campanulate, brown tinged lead color; stem very long, filiform; on sphagnum. 863. *M. praelonga* Pk.

(I) FILIPEDES

(a) Plants with bluish, reddish or yellowish tints; small and very slender.
(b) Base of stem adorned with blue hairs or mycelium threads. 865. *M. cyanothrix* Atk.
(bb) Without any blue tints.
(c) Gills somewhat flesh-color, uncinate; pileus rufous-yellowish; on wood. 866. *M. subincarnata* Pk.
(cc) Gills yellowish, not uncinate.
(d) Spores 7-9 x 3-4 micr.; pileus orange-red to bright-red, 2-6 mm. broad. 868. *M. acicula* Fr.
(dd) Spores 7-8 x 5-6 micr.; pileus dull-red to yellow, 5-12 mm. broad. 867. *M. pulcherrima* Pk.
(aa) Plants without any bright colors.
(b) Gills attached to a collar at the stem. 864. *M. collariata* Fr.
(bb) Gills not attached to a collar; small and very slender plants, fuscous.
(c) Gills free, crowded, white. *M. filopes* Fr.
(cc) Gills not free.
(d) Gills broadly adnate, distinct. *M. debilis* Fr.
(dd) Gills attenuate-adnexed, subdistant; pileus brownish to livid ashy. *M. vitilis* Fr.

Section I. Lactipedes. Flesh exuding a juice when broken; stem rooting, not viscid.

831. Mycena haematopa Fr.

Sys. Myc., 1821.

Illustrations: Fries, Icones, Pl. 83, Fig. 1.
Cooke, Ill., Pl. 162.
Gillet, Champignons de France, No. 450.
Atkinson, Mushrooms, Fig. 100, p. 100, 1900.
Hard, Mushrooms, Fig. 90, p. 123, 1908.
Marshall, The Mushroom Book, Pl. 37, op. p. 93.
Conn. State Geol. & Nat. Hist. Surv. Bull., No. 15, Pl. 10, 1910.

PILEUS 1-3 cm. broad, at first narrow elliptical then campanu-

late, obtuse, at first purplish-maroon then livid-reddish or paler, glabrous, striate, stained darker in age; the sterile *margin extends beyond the gills and is crenate.* FLESH thin, *bleeding when cut.* GILLS narrowly adnate, ascending, narrow, subdistant, whitish *soon reddish-stained,* edge flocculose. STEM 4-8 cm. long, 1.5-3 mm. thick, rigid, fragile, hollow, white-pruinate when young, at length glabrous except the hairy base, even, rufous-tinged, *exuding reddish juice when broken.* SPORES elliptical, 8-10 x 5-6 micr. (few larger), smooth, white. CYSTIDIA none. *Sterile cells* on edge of gills numerous, with swollen-ventricose base and tapering to a narrow acuminate point, about 50 micr. long. ODOR and TASTE mild.

Caespitose or subcaespitose, sometimes confluent, on decaying wood. In frondose and coniferous woods throughout the State. June to September. Rather frequent.

Known by the reddish juice of the flesh, the crenate flaps on the margin of the cap and the caespitose habit. The juice is not always equally abundant depending on weather and vigor of plant. All the parts of the plant become stained darker reddish in age. Fries does not mention the striations on the cap, which are sometimes quite marked.

A variety occurs on hemlock logs whose pileus is often markedly umbonate, at first striate, very rugose striate in age, its margin scarcely crenate. The gills at length secede and remain attached to each other behind by a false collar, often very veiny and staining reddish after being bruised. The stem and cap also become reddish-stained from the watery juice contained in the flesh. The juice itself seems uncolored but causes the bruised parts to assume the reddish stains. The base of the very caespitose stems is imbedded in cracks in the logs and is strigose with white hairs. It was collected during several seasons at New Richmond. It occurs in dense clusters. The spores are like those of *M. haematopa.*

832. Mycena sanguinolenta Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 83, Fig. 3.
Cooke, Ill., Pl. 163, Fig. 1.

PILEUS small, 4-6 mm. broad, soft, campanulate, obtuse or subumbonate, striate, glabrous, pale reddish then fuscous. FLESH membranaceous. GILLS narrowly adnate, broader in front, subdistant, rufous-tinged, *edge dark purple.* STEM 4-8 cm. long,

filiform, fistulose, flaccid, soft, glabrous, mycelioid, pallid or pale rufescent, *exuding reddish juice when broken.* SPORES 8-11 x 4-5 micr., long-elliptical. *Sterile cells* on edge of gills numerous, enlarged below, tapering to a point above, about 30 micr. long.

On the ground among leaves in frondose and mixed woods, sometimes in tamarack swamps. Throughout the State. June-September. Infrequent.

This little Mycena is smaller than *M. haematopa* and lacks the crenate margin of that species. It has a somewhat different habitat, is very soft and slender and when young the cap is dark red. It is readily distinguished from *M. haematopa* by the colored edge of the gills. Stevenson says it is common in Great Britain, but with us it occurs rather seldom, and prefers the northern area.

Section II. Glutinipedes. Stem viscid, without juice; gills at length uncinate.

833. Mycena leajana Berk.

Hooker, London Journal, Vol. IV, p. 300.

Illustrations: Hard, Mushrooms, Fig. 94, p. 127, 1908.
Conn. State Geol. & Nat. Hist. Bull. No. 15, Pl. 11, 1910.

PILEUS 2-3 cm. broad (rarely larger), convex, subexpanded, umbilicate, *covered by a tough, viscid, orange separable cuticle,* shining when moist, glabrous. FLESH rather thick, livid-whitish. GILLS adnate, becoming sinuate, rather narrow, close, thickish, yellowish to pale orange, *edge reddish to vermillion.* STEM 3-7 cm. long, 2-4 mm. thick, equal, even, hollow, tough-cartilaginous, viscid, at first yellow and covered by orange scurfy-pulverulence, varying below to strigose tomentum at times, attached by an orange-colored mycelium. SPORES elliptic-oblong, 8-9.5 x 5-6 micr., smooth, dented on one side. CYSTIDIA none; *sterile cells* on and near the edge of the gills, numerous, reddish-orange, about 45 micr. long, apiculate.

Caespitose on logs, branches and stumps in frondose and conifer woods. Throughout the State. July-September. Rather frequent, especially in the north.

This is a striking and beautiful species, easily recognized at a distance by the reddish-orange color of the rather dense clusters. The cap often fades to a livid-tan and finally to a whitish color, and then develops striations on the margin. This species does not

seem to be closely related to other Mycenas, and its position here is uncertain. It belongs more nearly to Heliomyces.

834. Mycena vulgaris Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 191.
Berkeley, Outlines, Pl. 6, Fig. 4.
Atkinson, Mushrooms, Fig. 9, p. 97, 1900.

PILEUS 5-15 mm. broad, convex to subexpanded, subviscid when moist, pale grayish-brown to fuscous, *umbilicate*, striatulate to umbilicus, somewhat darker in center, soft, fragile, sometimes papillate on center. FLESH membranaceous, subhygrophanous. GILLS *broad behind and subdecurrent*, subdistant, thin but sometimes thickish, often venose, white then grayish-white. STEM 2-5 cm. long, 1-1.5 mm. thick, cartilaginous, toughish, hollow, glabrous, somewhat rooting, *very viscid when moist*, straight or flexuous, equal, even, pallid brownish or grayish. SPORES broadly elliptical, 6-8 x 4-5 micr., smooth, white. CYSTIDIA and STERILE CELLS none or few. BASIDIA slender, 30 x 5 micr., clavate. ODOR and TASTE none.

Caespitose or gregarious. Attached to pine needles, leaves and sticks in conifer or frondose woods, so far only in the coniferous regions of the State. New Richmond, Marquette. August-September.

Mycena vulgaris, except for its viscidity, would be looked for under the genus Omphalia. Fries describes the pileus as "depressed," but it usually has the umbilicate character in our plants, and is practically an Omphalia with broad, subdecurrent gills. Authors differ widely as to size of spores. Massee and Karsten (Stevenson's British Fungi) give the measurements very small, 4-5 x 2 micr., while Schroeter says they are 9-11 micr. long. This discrepancy shows that these authors were dealing with different species. American authors do not give any spore measurements. When young and moist the pileus is quite viscid, but soon dries. The species is often very abundant under favorable weather conditions in the localities where it occurs.

835. Mycena epipterygia Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 208.
Patouillard, Tab. Analyt., No. 215.
Gillet, Champignons de France, No. 462.
Atkinson, Mushrooms, Fig. 96, p. 96, 1900.
Hard, Mushrooms, Fig. 96, p. 129, 1908.

Var. *A.* PILEUS 1-2 cm. broad, conic-ovate then campanulate or subhemispherical, obtuse, *subviscid* by a thin, separable pellicle, hygrophanous, at first yellowish-gray *then gray to fuscous,* glabrous, striate on the margin which is at first straight. GILLS arcuate-adnexed, uncinate, rather broad, ventricose, subdistant, whitish at first, grayish-rufescent in age, edge entire. STEM 4-5 cm. long, *2 mm. thick,* yellowish or pellucid pale yellow, *tough,* equal, straight or flexuous, tubular, sometimes twisted or compressed, *viscid by a thin, separable pellicle,* rooting. SPORES broadly elliptical, 9-10 x 6-6.5 micr., smooth, obtuse, white. CYSTIDIA none. ODOR none or slightly farinaceous. BASIDIA attenuated downward, clavate, 45 x 6-7 micr., 4-spored.

On the ground in low, elm woods. Detroit. October.

Form *typical.* This is a much more slender-stemmed plant, described and illustrated by Atkinson and Hard. The pileus is elongated-conical at first and the stem filiform. The colors are similar to Var. *A.* I have seen this form rather frequently in northern Michigan, but have no notes on it.

Var. *B.* PILEUS 5-8 mm. broad, obtusely conic-campanulate, glabrous, *with a viscid, separable, thin pellicle,* obscurely striatulate, *grayish-brown.* GILLS adnate-arcuate, uncinate, rather narrow, subventricose, *white,* intervenose. STEM *filiform,* 3-8 cm. long, 0.5 mm. thick, equal, *viscid,* flaccid, shining, glabrous, even, pruinose at apex, *pallid with brown tinge,* rooting and mycelioid at base. SPORES broadly elliptical, 8-9 x 5-6 micr., smooth, obtuse, white. CYSTIDIA none. BASIDIA about 24 micr. long. ODOR none or slightly nitrous. TASTE none.

On decorticated, half-decayed logs. New Richmond. September.

Mycena epipterygia, like the following, is probably a composite species, as Maire has pointed out. (Bull. Soc. Myc. France, Vol. 26, p. 160.) Fries placed a series of previously described species under this one and considered the colors insufficient to differentiate them.

Color, like size, shape and habitat, is very variable, but Fries did not consider any microscopic characters, hence it is likely he has been too conservative in this series, and sooner or later several species will be segregated. Maire (l. c.) has already separated *M. viscosa* Maire, a plant of the coniferous regions.

836. Mycena clavicularis Fr.

Syst. Myc., 1821 (var. *alba,* N. Y. State Mus. Rep. 28, 1885).

Illustrations: Fries, Icones, Pl. 84, Fig. 1.
Cooke, Ill., Pl. 208.

Var. *álba* Pk. PILEUS 5-7 mm. broad, conico-campanulate, *dull-white,* not changing, sulcate-striate, pruinose, dry (not viscid), without pellicle. FLESH membranaceous. GILLS adnate, moderately broad, close, *white,* edge obscurely flocculose. STEM 5-6 cm. long, *filiform,* .5 mm. thick, *pellucid-whitish, viscid when moist,* glabrous, long-rooting, even, fistulose, flaccid, flexuous, loosely hairy below. SPORES 7-9 x 5 micr., elliptical, obtuse at ends, smooth, white. CYSTIDIA none. *Sterile cells* on edge of gills inflated, rounded-pyriform on narrow stalks, 15-30 micr. in diam. BASIDIA about 24 micr. long, subclavate, 4-spored. ODOR none.

Caespitose or singly, attached to fallen leaves by the rooting, hairy stem, in mixed woods. New Richmond. September. Infrequent.

Var. *luteipes* nov. var. PILEUS 10-15 mm. broad, convex-campanulate, obtuse, striate up to the papilla, silky, not viscid, *sulphur-yellow with olivaceous or green shades,* brownish or grayish in age. GILLS adnate, uncinate or arcuate-subdecurrent, *yellowish, flesh color or rufescent in age,* rather narrow and distant, edge entire. STEM 5-8 cm. long, 1-1.5 mm. thick, slender, equal, hollow, *tough,* pruinose at apex, *viscid,* darker yellow than pileus, rooting at the somewhat attenuated base. SPORES broadly elliptical, 11-12 x 7-8 micr., smooth, white in mass.

On the ground among debris, mosses, etc. Bay View, Detroit. Rare.

M. clavicularis Fr. is doubtless a composite species. Fries, himself, considered it composed of a number of color forms, with caps either whitish, pale yellow or fuscescent. Peck named three varieties: *alba, cinereus* and *filipes.* The size of the spores seems to be omitted by authors. The two varieties described above are probably distinct species but further data on all the supposed

varieties are needed. The *M. clavicularis* group differs from the *M. epipterygia* group in the lack of a viscid pellicle on the pileus. Until these two groups have been more fully studied with reference to the microscopic characters, it is better not to segregate new species from them. Fries' figure shows a yellowish plant, somewhat smaller than var. *luteipes*.

Section III. Basipedes. Stem dry, juiceless, not rooting, the base naked and dilated into a disk, or strigose and swollen into a little bulb. Very thin, solitary, becoming flaccid.

837. Mycena stylobates Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 249.
Berkeley, Outlines, Pl. 6, Fig. 5.
Patouillard, Tab. Analyt., No. 624.

PILEUS 3-6 mm. broad, *campanulate-convex,* obtuse, dry, glabrous, *white, striate.* FLESH membranaceous. GILLS free, distinct behind, *distant,* ventricose, *white.* STEM, 2-5 cm. long, *filiform,* hollow, *white,* equal, glabrous, dry, seated upon an *orbicular, plane, striate subvillose base.*

Solitary on fallen leaves, in frondose woods. Ann Arbor. October. Rare.

Only two specimens were obtained. The pileus of our plant was glabrous, lacking the scattered pilose hairs attributed to it. Very delicate and fragile.

838. Mycena crystallina Pk.

N. Y. State Mus. Rep. 41, 1888.

PILEUS 4-10 mm. broad, conical then campanulate, subumbonate, *pure white to creamy-white,* obscurely striatulate, *pruinate* under lens, *due to minute, shining, glandular, capitate hairs and particles.* FLESH membranaceous. GILLS *narrow,* narrowly adnate or scarcely adnexed, thin, close, white. STEM 2-5 cm. long, filiform, hollow, white and adorned like pileus, *attached by a white-hairy strigose base.* SPORES narrow, 7-9 x 3 micr., smooth, white. CYSTIDIA none.

On cedar twigs, mosses, etc., in cedar and tamarack swamps.

Bay View and New Richmond. September. Infrequent.

Known by the glandular particles and hairs which cover the surface of cap and stem of the fresh plant. These can scarcely be seen with the lens on account of the minute size. The color varies somewhat as indicated above. This species was referred to the section Basipedes by Peck, but might with equal propriety be placed among the Adonidae. At times the strigose hairy base is not well-developed and it is then easily mistaken for *M. immaculata* Pk., but that species lacks the glandular covering. *Marasmius resinosus* is also glandular-viscid, but is a larger plant.

839. Mycena echinipes Fr.

Epicrisis, 1836 (Lasch, in Linn.).

Illustration: Fries, Icones, Pl. 84, Fig. 5.

PILEUS 2-5 mm. broad, very thin, convex, widely pellucid-striate, *white*, glabrous. FLESH membranaceous. GILLS broadly adnate, thick, distant, subvenose, *white*. STEM 2-3 cm. long, filiform, glabrous, hollow, white, *attached by a villose, bulbillose base*. SPORES 7-8 x 3 micr., smooth, white.

On decaying leaves in birch and hemlock woods. Bay View. September. Rare.

A minute species, closely related to others of the group.

Section IV. Caldontes. Stem juiceless, dry, base not bulbillate or dilated into a disk; edge of gills provided with cystidia which give it a deeper color than elsewhere.

In the preceding sections, *M. sanguinolenta* and *M. leajana* also have this character of the gills, but differ in other respects.

840. Mycena pelianthina Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 156.
Berkeley, Outlines, Pl. 6, Fig. 1.
Patouillard, Tab. Analyt., No. 418.

PILEUS 2-5 cm. broad, hemispherical-convex then expanded, obtuse, moist, *hygrophanous, varying purplish-livid to sordid brownish-violet*, fading to dingy whitish, striate. FLESH somewhat

fleshy, white. GILLS adnexed-rounded behind, becoming sinuate, narrow, at first dull violet, becoming brownish, close, *edge purple.* STEM 5-8 cm. long, 2-5 mm. thick, equal, often curved at base, fragile, hollow, even, glabrous, *sordid whitish or streaked with violaceous fibrils.*

Solitary or scattered. Among fallen leaves in frondose woods. Throughout the State. July-September. Frequent.

Has the size of *M. pura,* but differs from it in that the edge of the gills is darker from the colored cystidia, in the more solitary habit and the cylindrical stem. Generally only one or two plants are found in a place. It seems to prefer maple, oak and beech woods. The color of the cap is variable and hard to describe, usually of a dirty color. Fries says it is intermediate between the genera Collybia and Mycena.

841. Mycena rosella Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 131.

PILEUS 4-15 mm. broad, campanulate-convex then hemispherical to subexpanded, obtusely umbonate, sometimes plane on disk, *sulcate-striate, pale rose color,* paler and tinged ochraceous in age, glabrous. FLESH membranaceous, fleshy at umbo. GILLS broadly adnate, slightly subdecurrent, medium broad, subdistant, *pale rose-colored, edge darker.* STEM 4-5 cm. long, 1 mm. thick, *pellucid-flesh color,* filiform, hollow, cartilaginous, slightly tough, *glabrous,* even, attached at base by white, hairy tomentum. SPORES oblong-elliptical, 8-9 x 4 micr., smooth, white. CYSTIDIA on sides and edge of gills, dense on edge, ventricose, narrowed to acuminate above, 60-70 x 12-15 micr., filled with a rosy to flesh-colored sap when mature. ODOR at first none, becoming nitrous after being picked.

Caespitose, usually of 2 or 3 stems, sometimes connate by the white tomentum, sometimes gregarious. On and among pine needles and other fallen leaves, in woods of white pine and oak.

New Richmond, Marquette. September-October. Common locally.

This pretty little Mycena is well named. It can be easily distinguished by the pale rosy coloring of the cap and gills and by its habitat. The surface of the cap and stem is slightly viscid or lubricous when the plant is fresh, and this is due to a very thin

layer of subgelatious hyphae which cover these parts. After drying out somewhat it was found that a nitrous odor developed; this fact does not seem to be mentioned elsewhere. Peck reports the species from New York, but elsewhere it seems to have been overlooked. The attachment of the gills is almost like that of the genus Omphalia, and the color of the gills is apt to lead one to place it among the pink-spored group. *Mycena capillaripes* Pk. (N. Y. State Mus. Rep. 41, 1888) is very close to if not identical with it.

842. Mycena purpureofusca Pk.

N. Y. State Mus. Rep. 38, 1885.

"PILEUS 8-16 mm. broad, *not hygrophanous,* campanulate or convex, obtuse, glabrous, *striate, purplish-brown.* FLESH membranous. GILLS adnate, ascending, lanceolate, subdistant, white or whitish, *purplish-brown* on the edge. STEM 2.5-7.5 cm. long, scarcely 2 mm. thick, *slender,* even, hollow, glabrous, with white hairs at the base, colored like the pileus or a little paler. SPORES subglobose or broadly elliptical, 6-7.5 x 6.5 micr."

On mossy hemlock logs in woods. Bay View. September. Rare.

Peck says it is closely related to *M. rubromarginata* Fr., from which it differs in its darker color and non-hygrophanous striate pileus. Longyear, in the 4th Report of the Michigan Academy of Science, lists *M. rubromarginata* Fr. but he is uncertain of the identification; it is probably Peck's species.

843. Mycena denticulata Pk.

Torr. Bot. Club, Bull. 32, 1905.

PILEUS 8-18 mm. broad, campanulate, toughish, often obtusely subconic, glabrous, *not striate,* grayish-brown, darker on center, margin soon split. FLESH thin, membranous. GILLS adnate with slightly decurrent tooth, often adnexed-emarginate then broader, *medium broad,* ventricose, subdistant, thickish, whitish, *edge dark brown, crenulate,* sometimes venose-connected or a few forked. STEM 3-6 cm. long, 1-1.5 mm. thick, equal, slender, even, hollow, *toughish,* glabrous or subfurfuraceous with minute brown dots, pallid. SPORES sub-globose to elliptic-oval, 7-8 x 5-7 micr., smooth, white. CYSTIDIA none. *Sterile cells* on edge of gills,

short, subelliptical-saccate, obtuse, 30-35 x 12-15 micr., filled with brownish substance as shown under microscope.

On rotten wood or humus, in oak and maple woods. Ann Arbor, New Richmond. June-September. Infrequent.

This little Mycena was described by Peck from material sent to him from St. Louis, Mo., by Glatfelter. Peck says the edge is purplish, but there is scarcely any tint of that color in the gills of our specimens; nevertheless the two forms appear to be identical in other respects. In general appearance and habitat it imitates *Collybia floccipes* Fr., but the stem is less purely white, the gills have the brown-dotted edge, cystidia are lacking and the spores are slightly larger.

Section V. Instititiae. Stem inserted (i. e. attached directly to other plant parts without root-like base or tubercle, etc.), dry. Gills adnate, uncinate (not truly decurrent as in Omphalia).

844. Mycena corticola Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 164.
Fries, Icones, Pl. 85, Fig. 2.
Gillet, Champignons de France, No. 458.
Hard, Mushrooms, Fig. 93, p. 126, 1908.
Patouillard, Tab. Analyt., No. 217.

PILEUS 4-8 mm. broad, hemispherical, obtuse or at length subumbilicate, distantly *striate,* flocculose-pruinate, blackish (when young), becoming fuscous, cinereous, grayish-ochraceous, etc. FLESH thin, membranaceous. GILLS adnate, uncinate, *distant, broad,* subovate, paler than pileus. STEM 6-12 mm. long, 1 mm. thick, slender, *incurved,* glabrous or minutely furfuraceous, paler than pileus.

On the bark of living trunks of frondose trees; everywhere, especially on shade trees of cities. Probably throughout the State, very common in southern part. July-October.

After rains, in late summer and fall, this little Mycena appears in large numbers, scattered over the trunks of our shade trees, elm, maple, etc. It appears to revive somewhat after succeeding rains, but the texture is that of a Mycena rather than a Marasmius. The color is very variable, especially during development. *M. hiemalis* Fr. is said to be its near relative, and to grow in similar situa-

tions, but I have been able to distinguish only *M. corticola* within our area.

845. Mycena setosa (Sow.) Fr.

Hymen. Europ., 1874.

Illustration: Cooke, Ill., Pl. 193.

PILEUS 1-2 mm. broad, minute, very thin, hemispherical, obtuse, glabrous, *becoming fuscous.* , GILLS distant, *narrow,* white. STEM delicately filiform, .10-12 mm. long, *inserted,* capillary, *everywhere shaggy with distant spreading hairs.*

On fallen leaves and pine needles, in woods of white pine and beech. New Richmond. September. Rare.

Section VI. Adonidae. Stem dry and usually growing from the ground. Gills of one color, neither darker on edge, nor becoming ashy nor fuscous.

The plants in this section are usually brightly colored or white, not with ashy or fuscous shades on cap and gills. Those of the following sections often have white gills at first but become tinged with cinereous or fuscous color, although this character is in some cases scarcely determinable in fresh specimens.

846. Mycena pura Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 157.
Gillet, Champignons de France, No. 476.
Gillet, (var. *alba*) No. 477.
Gillet, (var. *lutea*) No. 478.
Bresadola, Fung. Trid., Vol. 2, (var. *multi-color*) Pl. 114.
Patouillard, Tab. Analyt., No. 313.
Atkinson, Mushrooms, Fig. 95, p. 95, 1900.
Hard, Mushrooms, Fig. 95, p. 128, 1908.
Swanton, Fungi, Pl. 8, Fig. 3 and 4, 1909.

PILEUS 2-4 cm. broad, rarely broader, campanulate to convex, finally expanded, more or less obtusely *umbonate,* sometimes broadly so, moist, striatulate on margin, *bright rosy-red,* sometimes rose-purplish, lilac or violet. FLESH thin, moist. GILLS adnate, sinuate, *broad,* ventricose, subdistant to close, varying rose, violet,

white, etc., often veined or with the interspaces veiny. STEM 5-10 cm. long, 2-4 mm. thick, *cylindrical*, sometimes twisted, even, toughish, *glabrous*, hollow, more or less hairy at base, colored like or paler than pileus. SPORES elliptic-oblong, 6-7 x 3-3.5 micr., smooth, white. CYSTIDIA few on sides of gills, clavate-cylindrical, about 40-50 x 12-15 micr. *Sterile cells* not abundant on edge of gills, similar but smaller. ODOR somewhat of radish.

Caespitose or scattered to solitary. On humus, moss or much decayed logs in frondose or mixed woods, or tamarack, balsam and cedar swamps. Throughout the State. June to October. (Earliest record June 14, latest October 4.) Common.

A widely distributed Mycena, beautifully colored and one of the larger species of the genus. Its prevailing color, which often extends into the gills, is a pale rose-purple (Ridgway, new ed.), although it varies, under different conditions, localities or in age, to darker or lighter shades. Peck (23rd Rep.) says the umbo is lacking, but I have seen it often in the form shown by Cooke, Patouillard and Gillet in their illustrations. Schroeter (Die Pilze Schliesiens) says the edges of the gills are densely beset with cystidia. This is shown in Patouillard's figure; these I have usually referred to as "sterile cells." The very young pileus is ovate-subconical, and hoary-pubescent.

847. Mycena minutula Pk.

N. Y. State Mus. Rep. 25, 1873.

PILEUS 2-8 mm. broad, campanulate then expanded, *white, papillate,* glabrous, moist, striatulate to center. GILLS adnate with tooth, subdistant, *rather broad, white*, interspaces venose. STEM 2-4 cm. long, filiform, scarcely .5 mm. thick, *white*, elastic, *covered throughout its length by microscopic, subcylindrical hairs,* about 30 micr. long, 4-6 micr. thick, which give it a mealy appearance. SPORES 6-8 x 3.5-5 micr., elliptical, oval, smooth, white. BASIDIA 4-spored, 18-20 micr. long. CYSTIDIA none. ODOR and TASTE none.

Gregarious or scattered on moss of prostrate trunks, on rotten wood, twigs, etc., of pine, beech and oak woods. New Richmond, Ann Arbor. September-October. Infrequent.

The pruinosity of the stem and the entirely white color of the spores characterize this little species. It must not be confused with *M. crystallina* Pk. and *M. immaculata* Pk.

848. Mycena immaculata Pk.

N. Y. State Mus. Rep. 38, 1885.

PILEUS 4-8 mm. broad, conical or subhemispherical, *glabrous,* slightly striate on the margin, pure *white.* FLESH membranaceous. GILLS adnate or uncinate-decurrent, moderately broad, *distant,* white. STEM 1.5-3.5 cm. long, scarcely .5 mm. thick, slender, *pellucid-white,* glabrous, generally villose-strigose at the base, slightly thickened at apex. SPORES oblong or cylindrical, 7.5-9 x 3 micr.

On mosses and fallen leaves on the ground. Bay View. August.

This seems to differ sufficiently from *M. lacteus* Fr. which has crowded narrow gills; the latter grows caespitosely on wood according to Stevenson (British Fungi), while Fries (Epicrisis) says it is generally found on the ground. *M. minutula* Pk. and *M. crystallina* Pk. should be compared with it.

Section VII. Rigipedes. Stem firm, rigid, somewhat tough, juiceless, somewhat strigose and rooted at the base. Gills becoming tinged with gray, flesh color, fuscous, etc. Pileus *not hygrophanous.*

Tough, persistent, inodorous, normally *growing on wood and caespitose.*

Fries originally (Syst. Myc., Vol. I, p. 13) included some of the following species under *M. galericulata.* In Epicrisis he divided the latter into a number of species. As Fries did not consider any microscopic characters, some of these species have been much misunderstood, and even today no clear account can be given by which they can, with entire certainty, be separated. I have attempted below, by using such critical studies as others have made with the microscope, and adding my own, to separate those which have been found in my collecting by using the characteristics of the spores and cystidia. As Fries pointed out (Epicrisis, p. 104), the color, especially of the stem, is very deceptive in many of these species, and cannot be relied on to any great extent for their separation.

**Pileus and stem usually brown or dark colored, not constantly gray.*

849. Mycena galericulata Fr. (Edible)

Syst. Mycol., 1821 (in part).

Illustrations: Fries, Icones, Pl. 80, Fig. 2 (var.).
Cooke, Ill., Pl. 222 and Pl. 223 (var.).
Gillet, Champignons de France, No. 462.
Patouillard, Tab. Analyt., No. 214 and No. 317.
Hard, Mushrooms, Pl. 16, Fig. 89, p. 121.
Marshall, The Mushroom Book, Pl. 7, op. p. 55.
Michael, Führer f. Pilzfreunde, III, No. 92.
Clements, Minnesota Mushrooms, Fig. 17, p. 30, 1910.
Moffatt, Nat. Hist. Surv. Chicago Acad. of Sci., Bull. 7, Pl. 4.

PILEUS 2-4 cm. broad, campanulate or obtusely conic-campanulate, umbonate, *striate or subsulcate to umbo,* glabrous, *buff on margin, shading to brown or umber on umbo,* ashy white and subshining when old, often with brown or blackish-ferruginous stains. FLESH thin, toughish, whitish. GILLS *adnate* or arcuate-adnate, *uncinate,* moderately broad, subdistant, dull white, *usually tinged with flesh color in age,* often stained when old, edge entire or crenulate-eroded, interspaces usually venose. STEM 4-10 cm. long or longer, 1-3 mm. thick, *tough,* very tough in age, *cartilaginous,* hollow, *even* or only innately striatulate, flexuous, sometimes twisted, *from pallid to rufous-brown or ferruginous-stained below,* paler to whitish at apex, glabrous and shining, base often connate with ferruginous or dingy-yellow strigose hairs, and rooting. SPORES 8-9 x 5-6 micr., broadly-elliptical *when mature,* smooth, white, immature spores with large globule simulating globular spores. BASIDIA 4-spored, with long and stout sterigmata. CYSTIDIA *none.* ODOR none or slightly farinaceous.

Very caespitose on rotten wood, old logs, stumps, etc., of all kinds of trees.

Throughout the State. March-November. (Earliest record March 15; latest, November 2.) Very common.

Reported throughout North America, Europe, Tasmania, etc. The weather and locality bring about much variation in this species, especially as to color and texture. The essential characters seem to be the lack of cystidia, the absence of a nitrous odor, the caespitose rufous-brown stems, the sulcate-striate cap, which is often

stained in moist weather, the tendency for the white gills to assume a flesh tint and the size of the spores. The stains on cap and gills and base of stem are dingy yellow, purplish-brown or dark ferruginous. At other times, especially in dry places, the pilei become silvery-shining and scarcely stained. In mounting a section of the gills the large mature spores with homogeneous contents sink to the bottom of the water on the slide. The immature spores are subspherical and contain a large globule which is more prominent than the wall of the spore and accounts for the fact that to some observers the spores look spherical. Patouillard reports that a common variety has 2-spored basidia; I have not found it. *M. haematopa,* which becomes stained in the old stage must not be confused with this species. Occasionally the stem is striate but this form differs from *M. polygramma* var. *albida* in the lack of cystidia, and in our territory by the different colors.

Var. *calopus* Fr.

Illustrations: Fries, Icones, Pl. 80, Fig. 2.
Cooke, Ill., Pl. 223 A.

Like *M. galericulata*, except that the gills are adnexed, the stem striatulate and coherent or proliferous at base, joined together and covered by rusty or brown strigose hairs, elsewhere rufous-bay color and shining. Spores as in *M. galericulata*. No cystidia. The appearance of the stem reminds one of that of *Marasmius cohaerens,* but the pileus, etc., are very different.

Caespitose, on decaying logs in woods. Ann Arbor. May and June. Infrequent.

850. **Mycena inclinata** Fr. var.

Epicrisis, 1836-38.

Illustration: Plate CXLIX of this Report.

PILEUS 2-3 cm. broad and high, obtusely conical at first, then persistently conical-campanulate *with a broad oblong strongly marked umbo,* at length with a spreading or recurved margin, often gibbous-cernuous, dry, striate to the middle, *fuscous-brown,* umbo smoky-fuscous, darker colored in age. FLESH thin, concolor or paler. GILLS narrowed behind and sinuate-adnexed, *not uncinate,* narrow, ascending, crowded, soft, whitish or grayish-fuscescent,

edge entire. STEM 3-6 cm. long, 2-5 mm. thick, curved, *twisted,* hollow, *often compressed or furrowed,* toughish-fibrous and splitting longitudinally under pressure, subfibrillose, pallid above, fuscous below, *fuscescent or blackish-fuscous throughout in age,* rooting. SPORES broadly elliptical, 8-10 x 5-6 micr., smooth, white. CYSTIDIA none. ODOR fungoid.

Caespitose or subcaespitose on logs in woods of juniper, oak, etc. Ann Arbor. October. Infrequent.

Apparently intermediate between *M. prolifera* and *M. inclinata,* concerning whose microscopic characters little is known. It is allied to the former by its broad and dark umbo and to the latter by the character of the stem, the cernuous pileus which is at first much incurved and the strongly fuscescent colors of cap and stem. The narrow gills are still more narrowed and broadly sinuate behind. The pileus often undulates from umbo to margin, and remains obtusely conic-campanulate. No tendency of the stem to proliferate was observed. It is very distinct from *M. galericulata.* The figure of Gillet does not appear to agree at all with the description of Fries.

851. Mycena excisa Fr.

Epicrisis, 1836.

Illustration: Fries, Icones, Pl. 81, Fig. 1.

PILEUS 1.5-4 cm. broad, *firm,* campanulate, broadly umbonate, gibbous, dark brown, *dark umber or blackish-fuscous, rugulose,* margin at first straight. FLESH concolor or paler. GILLS adnexed by an abruptly much narrower portion, elsewhere *rather broad,* ventricose, *subdistant, thickish,* pallid then tinged brownish. STEM short, 2-3 cm. long, 2-4.5 mm. thick, equal, floccose-fibrillose, glabrescent, stuffed then hollow, *rigid, toughish,* often twisted, sometimes compressed, *fuscous-brownish,* darker in age. SPORES elliptical, 8-10 x 5-6 micr., smooth, apiculate, white. CYSTIDIA moderately abundant, cylindrical above, ventricose above the slender pedicel, obtuse, 75-110 x 15-18 micr. BASIDIA about 40 x 6 micr., 4-spored. ODOR and TASTE none.

Caespitose or subcaespitose to gregarious. On the ground, among grass in oak woods. Ann Arbor. October-November. Infrequent.

Known by its dark brown cap, its short stem which is rigid and rather tough, and the abruptly narrowed and slightly adnexed

gills. It has scarcely any tinge of gray to either cap or stem. The stem is sometimes strongly entwined on the grass-stalks or obliquely attached to buried roots, etc. Fries has not adhered to the same description in his different works; our plants agree best with the description in Icones, although in size and build they are more like the figures of *M. dissiliens* of the same work. The cystidia are large and striking.

***Pileus fundamentally gray, or some shade of gray, or white.*

852. Mycena parabolica Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 80, Fig. 3.
Cooke, Ill., Pl. 224.

PILEUS 1-3 cm. broad, campanulate, *margin at length recurved,* umbo obtuse, *striate,* becoming coarsely rugose-striate, *sometimes sulcate,* moist, glabrous, *at first blackish-cinereous,* especially on center, *then gray to pearl-gray* or whitish when dry, disk darker. FLESH thin, *concolor at first.* GILLS narrowly adnate, *not uncinate, narrow,* at first ascending and close, then subdistant, whitish, *then tinged cinereous,* edge entire. STEM 3-10 cm. long, 1.5-2.5 mm. thick, sometimes long and rooting, cartilaginous, hollow, terete or compressed, *even,* glabrous, *cinereous,* fading, the rooting base white-hairy and curved or flexuous. SPORES 8-10 x 5-7 micr., elliptical, ends obtuse, smooth, white. CYSTIDIA few, lanceolate, soon collapsing, sometimes on the edge of the gills; sterile cells none. BASIDIA 4-spored, 27 x 8 micr., with prominent awl-shaped sterigmata, 6 micr. long. ODOR none.

Solitary, gregarious or subcaespitose. On or around decaying logs, stumps in mixed woods of white pine and beech. New Richmond. September.

This gray Mycena is frequent locally. The margin of the cap becomes expanded or recurved and is then coarsely sulcate on account of the thin flesh. The young stage distinctly shows its non-identity with *M. galericulata.* The stem is not as rigid as that of its neighbors and becomes somewhat flaccid in age.

853. Mycena polygramma Fr.

Epicrisis, 1836.

Illustrations: Cooke, Ill., Pl. 223.
Michael, Führer f. Pilzfreunde, III, No. 91.

Var. *albida* Kauff. Mich. Acad. Sci. Rep. 13, p. 219.

PILEUS 2-5 cm. broad, campanulate or conic-campanulate, dry, obtusely subumbonate, *sulcate-striate on margin* in large specimens, *white*, whitish-buff or grayish, glabrous, atomate when dry. FLESH white, thin. GILLS *narrowly adnate, not uncinate,* ascending or arcuate, rather broad in middle, subdistant, white, with a faint flush of pink in the gray forms, edge even. STEM 5-10 cm. long, 2-4 mm. thick, *equal*, cartilaginous, hollow, *striatulate or distinctly striate at apex or throughout,* sometimes twisted, straight or flexuous, firm and rather rigid but fragile, glabrous and *shining,* white or grayish-white, hairy at base. SPORES 8-10 x 5-6 micr., broadly elliptical, ends rounded, smooth, white. CYSTIDIA fusiform-acuminate, *abundant,* 45-75 x 9-15 micr. BASIDIA 4-spored, sterigmata slender. ODOR *nitrous,* varying from slight to strong.

Caespitose, gregarious or solitary on decaying logs of maple, elm, basswood, etc. Ann Arbor. May-June. Frequent locally.

Not to be confounded with *M. alkalina,* which lacks cystidia or possesses but a few of them, and which has pseudo-viscid stems. The typical *M. polygramma* of Europe has not been recognized with certainty and appears to be rare. Atkinson has referred *M. praelonga* Pk. to it, but the latter is kept intact in this report. Our plants, described above, are relatively large, almost pure white and have striate stems and a nitrous odor. It cannot be *M. sudora* Fr. since the cap is not viscid.

854. Mycena lasiosperma Bres.

Fung. Trid., 1881.

Illustration: Ibid, Pl. 37, Fig. 1.

PILEUS 5-20 mm. broad, conic-campanulate then expanded-umbonate, *subviscid,* striatulate to umbo, subhygrophanous, *dark cinereous,* almost black on umbo, paler toward margin. FLESH thin, concolor. GILLS adnexed, with tooth, close, ventricose, whitish

then tinged gray, interspaces venose, stem 3-7 cm. long, 1-2 mm. thick, equal or attenuated below, *toughish* and *firm*, flexuous, hollow, white-pulverulent, brownish above, paler below, curved-rooting. SPORES spherical, *covered with blunt, rod-like tubercles*, 6-7 micr. diam., *white*. CYSTIDIA moderately abundant, fusoid, attenuate above, 45-60 x 8-12 micr. ODOR slight or none.

On very rotten wood and debris in beech and maple forest (Quirk's woods, east of Ypsilanti, Michigan). Gregarious or subcaespitose. August. Rare.

An interesting find of a remarkable plant which does not seem to have been noted except by its discoverer. The structure of the spores naturally leads one to suspect an Inocybe, but their color is white (hyaline under the microscope), and the habit of the plants is that of a Mycena. Bresadola describes it as having a strong odor of rancid meal, which our plants seemed to lack. The stems become firmer and tougher on drying and it is placed by Saccardo under the Rigipedes next to *M. raeborrhiza* which is said to have tuberculate spores. The latter is, however, a very different plant both in color and shape, according to the figure of it by Fries. (Icones, Pl. 83, Fig. 4.) Two other species of Mycena have been described with tuberculate spores, *M. bryophila* Vogl. and *M. receptibilis* Britz.

855. Mycena cyaneobasis Pk.

N. Y. State Mus. Rep. 51, 1898.

Illustrations: Ibid, Pl. B, Fig. 1-7.

PILEUS 6-15 mm. broad, tough, firm, elliptic-oval at very first, then conic-campanulate, dark aeruginous-brown at first, at length paler and grayish, especially toward *the bluish margin*, glabrous, papillate or obtuse, striatulate on margin. *Trama* composed of a thick amorphous to subgelatinous upper layer, elsewhere pseudoparenchymatous. GILLS narrowly *adnate*, not uncinate, ascending, rather narrow, close, whitish or tinged grayish, edge minutely fimbriate. STEM 5-8 cm. long, 1-1.5 mm. thick, equal, slender, *flexuous*, terete or composed, tubular, cartilaginous, elastic, *floccose-pruinose at first*, glabrescent, *grayish-brown*, hairy and rooting at base. SPORES subspherical, 7-8 micr. diam., smooth, white. CYSTIDIA none. *Sterile cells* on edge of gills *filiform*, numerous, 40 x 2 micr., hyaline. OROR and TASTE mild or slightly of radish.

Subcaespitose, among leaves and much decayed wood in fron-

dose woods. Ann Arbor. June and October. Infrequent.

This differs but little from *M. cyanothrix* Atk. The pileus and stem are slightly gelatinous when moist. The mycelium has a bluish tinge or is dull white. There is a bluish-green tinge to the young pileus which is sometimes slightly zonate. Peck referred it to the Rigipedes where it is somewhat doubtfully retained. *M. cyanothrix* seems to have a much longer rooting stem, adnexed gills, and the stem is glabrous and differently colored. It may turn out to be identical with *M. cyaneobasis*. In Europe three other small Mycenas with blue tints have been described, *M. marginella* Fr., *M. iris* Berk. and *M. calorhiza* Bres., all closely related. The last, however, has spores very different from either of ours.

Section VIII. Fragilipedes. Stem *fragile,* dry, juiceless, scarcely rooting, neither dilated nor inserted. Pileus *hygrophanous.* Gills white then tinged grayish or fuscous.

Delicate, fragile, often soft, *usually odorous,* normally on the ground, debris, leaves, etc., not densely caespitose on wood (except *M. alkalina*).

This section, like the preceding, needs a revision on a microscopical basis, especially of those species with nitrous or alkaline odor; the latter have been arranged as well as possible in the absence of detailed information from European sources. We have a number of forms with a more or less nitrous odor, some of which have not been included below for lack of data.

856. Mycena alcalina Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 81, Fig. 3.
Cooke, Ill., Pl. 187.

PILEUS 1-2.5 cm. broad, campanulate (at first narrowly ovate to conic-campanulate), obtusely umbonate or obtuse, glabrous, *hygrophanous,* deeply striate (moist), *grayish-brown to grayish-umber (moist)*, fading to grayish when dry, center always darker. FLESH thin, membranous. GILLS narrowly adnate, arcuate ascending, close to subdistant, *whitish then glaucous-gray*, or yellowish in age. STEM 3-7 cm. long, 1-2 mm. thick, rigid, *fragile*, terete or compressed, slippery-subgelatinous, hollow, *even*, glabrous, pallid-brown, sometimes darker at first, fading, the rooting base white-strigose. SPORES 9-10 x 5-6 micr., broadly elliptical, smooth, ob-

tuse at ends, white. CYSTIDIA none or few, then sublanceolate to subfusiform, 45-65 mm. long. *Sterile cells* ventricose below, obtuse-cylindrical above, abundant, 35-42 micr. long. ODOR strongly *nitrous.*

Caespitose, gregarious or solitary, on decayed logs and debris of tamarack, elm, etc. Ann Arbor, New Richmond. May-June and September-November. Not very common.

Characterized by the odor, by the few cystidia, and the slippery pseudo-viscous stem. The surface of the cap is composed of large, brown, erect, vesiculose cells. There is no separable pellicle, and the stem is not truly viscid, but feels gelatinous when applied to the lips. It differs from *M. ammoniaca* in its slippery stem, lack of a decurrent tooth at the attachment of the gills, and in the differently shaped spores. In *M. alcalina* the spores are symmetrically elliptical, in *M. ammoniaca* they are pip-shaped, i. e., narrowed and pointed toward one end. Both may be found on the decayed debris of leaves and wood on the ground and both may occur solitary or gregarious, although *M. ammoniaca* is rarely, if ever, caespitose. Both differ from *M. metata, M. leptocephala* and *M. constans* in the marked excess of brown shades instead of gray.

857. Mycena ammoniaca Fr.

Epicrisis, 1836.

Illustration: Cooke, Ill., Pl. 238.

PILEUS 5-15 mm. broad, conic-campanulate, but obtuse (at first elliptic-ovate), umbonate, hygrophanous, *striatulate* on margin, glabrous, fuscous-blackish to grayish-brown (moist), grayish buff or paler (dry). FLESH membranaceous, concolor. GILLS adnate, *uncinate,* close to subdistant, *narrow* and *linear,* interspaces venose at times, whitish then pale cinereous, often dark cinereous at the very first. STEM 3-5 cm. long, 1-1.5 mm. thick, toughish, equal, *straight, hollow, even, not slippery, whitish to pale brownish-ashy,* white mycelioid at base, scarcely rooting. SPORES 8-10 x 6-7 micr., pip-shaped, or elliptical-ovate, *pointed at one end,* smooth, white. CYSTIDIA none or few, *short, stout,* ventricose and obtuse, 36-40 x 15 micr. BASIDIA about 30 x 6 micr., slender. ODOR strongly *nitrous.*

Gregarious or scattered among leaves, remnants of decayed wood, etc. Ann Arbor, New Richmond. May-June and September-October. Infrequent.

Mostly separable from *M. alcalina* by its terrestrial, scattered habit, smaller size and dry stem. *M. metata* has narrower spores, the odor is faint or obsolete, and the shape of the pileus is often more convex. The stem of this species is slightly tough and might on this account be referred to the Filipedes. The trama of the gills is composed of rather large cells, among which globose vesicular cells are conspicuous.

858. Mycena metata Fr.

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 228.

PILEUS 5-20 mm. broad, convex-campanulate, varying to *narrowly campanulate, hygrophanous*, umbonate, obtuse, *striate* and *ashy-brown* (*moist*), pale ashy to brownish-ashy (dry), glabrous. FLESH thin, membranaceous. Gills adnate, ascending, *narrow*, close to subdistant, cinerascent or tinged flesh color, *edge obscurely flocculose*. STEM 4-6 cm. long, 1.5-2.5 mm. thick, equal, fragile, toughish, dry, hollow, even, grayish-brown or paler, flexuous, hairy at base. SPORES 9-11 x 4-5 micr., *narrowly* elliptical, sometimes narrower toward one end, variable, smooth, white. CYSTIDIA none. *Sterile cells* on edge of gills globose-pyriform, about 25-30 x 18 micr., covered above by very short, rod-like protuberances. ODOR weakly alkaline when plants are fresh.

Gregarious or subcaespitose among moss and grass, in tamarack, cedar and hemlock swamps. Ann Arbor, Bay View. September-November. Infrequent locally.

The microscopic characters are the best mark of this species. The color is between grayish-brown and ashy (see Chapman), fading to pale ashy or whitish. The shape of the cap varies considerably in the same patch. Fries, in his later works, Epicrisis and Hymen. Europ., does not give the shape. In Systema, however, he says it is campanulate, one-half inch across. Massee (British Fungus Flora) and Stevenson (British Fungi), mislead by speaking of the young cap as hemispherical. It is apparently most abundant in late autumn, in or on the borders of swamps among sphagnum or other moss and grasses, even after heavy frosts. The trama of the gills is composed of large, cylindrical cells. It differs from *M. ammoniaca* in its microscopic characters and its habitat, and by the paler color of its cap.

859. Mycena leptocephala Fr.

Epicrisis, 1836.

Illustration: Cooke, Ill., Pl. 187.

PILEUS 5-20 mm. high and broad, conico-campanulate, *scarcely hygrophanous,* fuscous-ashy (young and moist) *soon grayish-white or buff,* obtuse umbo tinged drab, often unicolorous, *striate to subsulcate when dry* and with a *glaucous* pruinosity, opaque. GILLS ascending, narrowed behind, adnate, *not uncinate,* not broad, ventricose, close to subdistant, whitish, then tinged pale cinereous. STEM 5-10 cm. long, .5-1 mm. thick, *filiform,* cartilaginous, elastic, glabrous, even, hollow, *darker than pileus when dry,* whitish above, subrooting. SPORES 8-9.5 x 5-6 micr. (rarely up to 10 x 7 micr.), elliptic-ovate, apiculate and somewhat pointed at one end, smooth, white. CYSTIDIA and *sterile cells* lacking. BASIDIA short, about 15-18 x 6-7 micr., 4-spored; sterigmata prominent, 6 micr. long. ODOR nitrous, varying weak or strong.

Solitary, scattered or rarely subcaespitose, among fallen leaves, mosses, decayed debris on the ground in woods. Ann Arbor, New Richmond. September-October. Not infrequent.

This is one of the gray Mycenas. It has been placed here because of the glaucous bloom on the cap when dry, referring to the "pruinosity" of Fries' description. No certainty can be reached in placing it because of lack of detailed data of related European species. It cannot be referred to *M. constans* Pk. which is a small plant and has a decurrent tooth to the gills. It might be referred to *M. consmilis* Cke., but that species is figured with shorter stems, and has no odor. Sometimes the cap and stem have a pale drab or faint purplish tint. The stem becomes flaccid in age, allying it to the Filipedes. The odor is often not noticeable until sometime after the plants have been picked, or when crushed.

860. Mycena dissiliens Fr. var.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 81, Fig. 2.
Cooke, Ill., Pl. 285.

PILEUS 5-15 mm. broad, obtusely convex at first, then campanulate to subexpanded, subumbonate, striatulate and *grayish-brown*

to umber (Sacc.) when moist, hygrophanous, fading to whitish, glabrous, substriate or even when dry, *margin at first straight.* FLESH watery brownish then whitish, membranous, not very fragile. GILLS adnate, *with a decurrent tooth,* ascending-arcuate, moderately broad, subventricose, close to subdistant, *white* then tinged with gray. Edge obscurely fimbriate, scarcely venose. STEM 3-4 cm. long, 1-3 mm. thick, often rather thick, *pellucid-white,* shining, glabrous, even, straight, equal, hollow, *fragile, easily split longitudinally.* SPORES 7-9 x 4-4.5 micr., narrowly elliptical, pointed at one end, smooth, white. CYSTIDIA rather abundant, subcylindrical, obtuse, 50-65 x 8-9 micr. on sides and edge of gills. ODOR none.

Scattered-gregarious on the ground among pine needles, moss, leaf mold, in woods of white pine, beech, etc. New Richmond. September. Infrequent.

These plants have been temporarily referred to *M. dissiliens;* they differ in that the pileus is not sulcate and the odor is lacking. The smell of *M. dissiliens* is said to be unpleasant. Our plant has a subgelatinous feel to the cap and stem, but there is no pellicle. The base of stem is scarcely hairy except where the mycelium masses among the decaying leaf mold from which it sometimes grows. The pileus dries to a glistening white, as does that of *M. stannea* Fr. It has the stature of a Collybia, as shown in Fries' figure of his species. It differs from *M. hemispherica* Pk. to which it appears to be related, in the much larger spores. The stem becomes very fragile with age and breaks on picking.

861. Mycena atroalba Fr.

Syst. Myc., 1821.

PILEUS 1-2.5 cm. broad, narrowly elliptical at first, then campanulate to expanded, umbonate, glabrous, hygrophanous, *umbo smoky-fuscous,* elsewhere pale grayish-white, sometimes uniformly fuscous-gray, fading, striate to the umbo when moist, radiately wrinkled or furrowed when dry, opaque. FLESH thin, concolor, rigid-fragile. GILLS narrowly adnexed, uncinate, close to scarcely subdistant, narrow, subventricose, white then pale cinereous, edge entire. STEM 4-6 cm. long, 1.5-2.5 mm. thick, equal, striate, rigid-fragile, subshining, glabrous, shining, even, *whitish above, dark fuscous below,* toughish, sometimes compressed, hollow, mycelioid-hairy and somewhat rooting. SPORES broadly elliptical, 8-9 x

5.5-6 micr., smooth, white. CYSTIDIA *none.* STERILE CELLS on edge of gills short, lanceolate, ventricose below. ODOR and TASTE none.

Gregarious. On the ground, moss and debris under tamarack trees. Ann Arbor. October. Infrequent.

The plants have the habitat of *M. metata,* but differ from it in the lack of odor, the dark-colored umbo and the microscopic characters. The gills are not provided with cystidia as in *M. atroalboides* and the stem is differently colored. Despite the similarity of the descriptions the two species are very distinct. Our plants differ from Fries' description in that the base of the stem lacks any marked "bulbous-tumid" root, therefore they are only provisionally referred to *M. atroalba.*

862. Mycena atroalboides Pk.

N. Y. State Mus. Rep. 27, 1875.

PILEUS 5-15 mm. broad, acorn-shaped at the very first, then conico-campanulate, finally umbonate and margin recurved, striatulate and *blackish-fuscous when moist and young,* hygrophanous, fading to fuscous or cinereous, and then subsulcate. FLESH *very thin,* membranaceous, whitish with a gray tinge. GILLS uncinate-adnexed, *narrow, close,* white, faintly grayish at length, edge entire. STEM *slender,* 4-10 cm. long, 1-1.5 mm. thick, equal or attenuated upwards, glabrous and even above, hollow, wavy, *fragile,* shining, terete or compressed, easily splitting lengthwise, *dark bluish or blackish-gray at apex,* tinged gray or fuscous elsewhere, sometimes connate with cottony fibrils below. SPORES 7-9 x 5-6 micr., broadly elliptical, smooth, white. CYSTIDIA numerous on sides of gills, subcylindrical, slightly ventricose below, obtuse, 75-85 x 7-8 micr. STERILE CELLS none.

Solitary or subcaespitose, on decayed wood and mosses, in woods of hemlock, beech, etc. New Richmond. August-September. Infrequent.

Manifestly related to *M. atrocyaneus* Fr. and *M. atroalbus* Fr. *M. atrocyaneus* is said to have the gills joined to a collar and distant, while the pileus is deeply sulcate. From *M. atroalbus, M. atroalboides* differs in possessing abundant cystidia on the sides of the gills and by its more uniformly colored pileus. A *form* occurs with pileus cylindric when very young and at first dotted with white, scattered, silky fibrils on the surface; its cystidia are thicker,

12-16 micr. in diameter. The young stem has a watery juice which is at first dark-colored. The tint of blackish-blue on young cap and stem is common to both forms.

863. Mycena prælonga Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustration: Atkinson, Mushrooms, Fig. 94, p. 94, 1900. (As *M. polygramma.*)

PILEUS 5-15 mm. broad, at first subcylindrical then conic-campanulate or subexpanded, umbonate, glabrous, striate, *dark brown with a leaden tint.* GILLS adnate, uncinate, arcuate-ascending, *narrow,* close to subdistant, white, at length subcinereous. STEM very long, 10-20 cm. long, .5-1 mm. thick, *filiform,* firm, innately striatulate, glabrous, hollow, tinged rufous-brown, white at apex, rooting in the sphagnum. SPORES 8-9 x 5-6 micr. when mature, subglobose or broadly elliptical, smooth, white. CYSTIDIA only on edge of gills, flask-shaped, with narrow, acuminate neck about 45 x 12-14 micr.

Gregarious. On sphagnum in tamarack swamps; local. Ann Arbor. May-June.

This species has been referred by Atkinson to *M. polygramma* Fr. It is known by its very long slender stem, by the leaden tint of the brown cap, and by the microscopic characters. Many of the bog species develop these long stems, apparently the result of the moisture present.

Section IX. Filipedes. Stem *filiform, flaccid,* somewhat tough, rooting, dry, juiceless. Gills whitish or tinged with the color of the cap. Pileus not hygrophanous.

Stem commonly very long in proportion to pileus; very slender, tense and straight when fresh, collapsing with age because of the flaccid texture; growing on the ground among mosses and grass, singly, i. e., not caespitose. Inodorous. Sometimes not easily distinguished from those of the Fragilipedes which have slender, filiform stems; and from the Adonidae, which differ, however, in the persistently white gills. A few brightly colored species are included here, which might perhaps be as well placed under the Adonidae.

864. Mycena collariata Fr.

Epicrisis, 1821.

Illustrations: Fries, Icones, Pl. 82, Fig. 5.
Cooke, Ill., Pl. 189.

"PILEUS 6-12 mm. broad, campanulate-convex, subumbonate, striate, typically fuscous, but *commonly whitish-gray* and only fuscous on disk, fading, glabrous. FLESH membranaceous. GILLS adnate, *joined in a collar behind,* thin, crowded, distinct, whitish or obsoletely incarnate. STEM filiform, 2-3 cm. long, tough, glabrous, shining, striatulate under a lens. SPORES 8-10 x 4-6 micr. (Sacc. and Berk.)."

Not yet found in the State. I have seen specimens on decayed logs in a neighboring State and it doubtless occurs in Michigan. It has the stature and appearance of *M. vulgaris,* but the cap is not viscid.

865. Mycena cyanothrix Atk.

Mushrooms, Edible, Poisonous, etc., 1900.

Illustrations: Ibid, Fig. 99, p. 99.
Conn. State Geol. and Nat. Hist. Surv., Bull. 3, Pl. 37.

PILEUS 1-2 cm. broad, *ovate to convex,* viscid when young, glabrous, striatulate on margin, *bright blue when young,* becoming pale and whitish in age or fuscous in the center. GILLS free, narrow, close, white then grayish-white, edge minutely fimbriate. STEM 6-9 cm. long, 1-1.8 mm. thick, slender, hollow, faintly purple when young, becoming whitish or flesh color, flexuous or nearly straight, even, rooting. SPORES globose, smooth, 6-9 micr., white or with a delicate bluish tinge.

Gregarious, subcaespitose or solitary, on decayed wood, debris, etc. Marquette, Bay View. Not rare in the north.

A slender, delicately tinted plant, so far found in our northern regions only. It differs from *M. cyaneobasis* in its thinner substance, *free gills and brighter colors.*

866. Mycena subincarnata Pk.

N. Y. State Cab. Rep. 23, 1872.

PILEUS 5-12 mm. broad, hemispherical then campanulate-convex, finally subexpanded, fragile, striatulate, *glabrous, pale, incarnate* or yellowish, usually dull reddish on center. FLESH thin, membranaceous. GILLS adnexed, rounded behind, not broad, ventricose, close, whitish *tinged flesh color.* STEM 2-5 cm. long, filiform, *pruinose,* equal, hollow, even, toughish, *pellucid-white,* base rooting and white-villose. SPORES 6-7 x 4 micr., elliptic-ovate, smooth, white. ODOR none.

Gregarious, on the ground or on mossy logs in hemlock or pine woods. Bay View, New Richmond. September. Infrequent.

Near *M. pulcherrima,* but differing in color, and size of spores. The stem becomes fuscous or darker in age.

867. Mycena pulcherrima Pk.

N. Y. State Cab. Rep. 23, 1872.

PILEUS 5-10 mm. broad, conico-campanulate to subcampanulate, subexpanded, obtuse, faintly striatulate on margin, *dull, yellowish to reddish,* paler toward margin, delicately glaucous, glabrous. FLESH membranaceous. GILLS adnexed, not uncinate, broad in the middle, *ventricose,* close to subdistant, *yellowish* or tinged like pileus. STEM 3-5 cm. long, .5-1 mm. thick, filiform, flaccid, equal, even, flexuous, white-pulverulent when young, glabrescent, *pellucid-white* and shining, white-hairy at base. SPORES 7-8 x 5-6 micr., oval-elliptical, smooth, white. CYSTIDIA none. ODOR none.

Scattered or in twos and threes, on very decayed wood or debris, under hemlock and pine. New Richmond.

A distinct little plant, to be separated from *M. acicula* Fr. by its habitat, larger size and different spores.

868. Mycena acicula Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 85, Fig. 3.
Cooke, Ill., Pl. 190.
Patouillard, Tab. Analyt., No. 108.
Atkinson, Mushrooms, Fig. 98, p. 98, 1900.

PILEUS 2-4 mm. broad, campanulate-convex, sometimes papillate, glabrous, glaucous, striatulate on margin, *vermillion, reddish-orange or yellowish* with red center. FLESH very thin, membranaceous. GILLS adnexed, ascending, ventricose, rather broad, *subdistant to distant,* yellow, yellowish, creamy white, or white, edge minutely crenulate. STEM 2-5 cm. long, filiform, equal, toughish, hollow, glabrous or minutely pulverulent at first, *pellucid-yellowish or yellow,* more or less rooting. SPORES 7-9 x 2.5-4 micr., *narrow, fusiform or narrowly subovate,* smooth, white. CYSTIDIA none. ODOR none.

Gregarious or scattered. On rotten wood, or among leaves and grass, in woods, meadows, thickets, etc. Ann Arbor, Detroit, etc. May-June and September-October. Frequent.

This is a pretty little Mycena and one of the earliest to appear. It is not by any means limited to the woods or to growing on wood or twigs as most authors remark, but may be found among grass on the ground in low, moist meadows in spring. The spores are quite characteristic and help not a little in its positive identification. I suspect, in fact, that it has been reported as *M. adonis* Fr. when occurring on the ground in grassy places, but no spore measurements of that species seem to have been printed. On decayed wood the stem is rooting and hairy along the root, whereas on the ground it has few hairs and is scarcely at all rooting. Other minute Mycenas with rosy or red caps have been described by Fries from Europe: *M. stipularis* and *M. juncicola* have non-rooting stems inserted on stipules of fallen leaves; *M. pterigenus* has a bulbillose stem attached to roots and leaves of ferns, etc.

Omphalia Fr.

(From the Greek, *omphalos,* an umbilicus.)

White-spored. Stem *cartilaginous,* slender, usually hollow or loosely stuffed, widened above with the pileus in trumpet-form.

Gills *decurrent,* or adnate-decurrent. Pileus more or less *membranaceous,* its margin at first either incurved or straight-appressed.

Epiphytal, lignicolous or terrestrial; putrescent plants, with few exceptions small or minute. Very closely related to Collybia when the margin of the pileus is at first incurved; and to Mycena when it is straight; differing from these by the decurrent gills. Toughish, reviving species are referred to Marasmius. They differ from Clitocybe by the cartilaginous character of the stem.

The PILEUS varies conical, hemispherical, convex or campanulate, often quite expanded in the Collybiariae, and usually marked by a distinct umbilicus which becomes widened in some species to infundibuliform; some species show the umbilicate character only in occasional specimens, e. g., *O. gracillima,* while the other specimens are obtuse or somewhat papillate. Its color is often pure white; it may be gray, fuscous, brown, yellow, orange or reddish. It is generally hygrophanous and then striate when moist. The surface is usually glabrous or with a very minute pubescence which is rarely glandular. The GILLS are decurrent, sometimes not strongly so, most often running far down as the cap expands. Their width and spacing are used to separate the species into subdivisions, although this is not always sharply marked. Peck in his monograph of the New York species (Rep. 45, 1892) states that in his opinion this grouping is unsatisfactory, but as no better is offered, it is adhered to in this paper. CYSTIDIA are lacking in most species, and when present are rather few and inconspicuous. The STEM is usually slender to filiform, and when dry its cartilaginous cortex is like that of Mycena. The surface is glabrous, horny and shining, or varying to pruinose or hairy at base. The SPORES are smooth. As in Mycena the immature spores are loosened in a microscopic mount; so the same precaution must be observed as when studying the spores of Mycena in order that one may get the correct measurements of the mature spores. Very few Omphalias have a distinguishing ODOR, and none of the following are nitrous or fragrant. Their EDIBILITY is of no interest because of their thin texture and small size; none are known to be poisonous, but probably few have been tested.

They are found from early spring to late autumn, during wet weather and in low or damp, shaded places. With the exception of *O. campanella* and *O. fibula,* they occur sporadically, few of them are found in quantities, many are but rarely found. A rather large number of species are described, Peck has named about twenty-five.

Key to the Species

(a) Plant wholly white.
(b) Gills broad.
(c) Stem tubular; plant snow-white. 879. *O. gracillima* Fr.
(cc) Stem solid; plant soon dingy-white. 878. *O. albidula* Pk.
(bb) Gills rather narrow.
(c) Gills crowded; plant pure white. 869. *O. scyphoides* Fr.
(cc) Gills moderately close; plant dull white. 870. *O. scyphiformis* Fr.
(aa) Plant not wholly white.
(b) Pileus viscid.
(c) Gills lilac; pileus greenish-yellowish. 872. *O. lilacifolia* Pk.
(cc) Gills whitish; pileus pale grayish-brown. (See 834. *Mycena vulgaris* Fr.)
(bb) Pileus not viscid.
(c) Pileus yellowish, orange or reddish.
(d) Stem date-brown, horny; on coniferous wood; gills very veiny. 883. *O. campanella* Fr.
(dd) Stem not date-brown and horny.
(e) Gills white or cream-colored; on mosses.
(f) Pileus 10-20 mm. broad; convex. 882. *O. fibuloides* Pk.
(ff) Pileus 3-8 mm. broad, cucullate. 880. *O. fibula* Fr.
(ee) Gills not white.
(f) Pileus brick-red to reddish-brown. 873. *O. pyxidata* Fr.
(ff) Pileus olivaceous-yellowish; stem dusky yellowish. 871. *O. olivaria* Pk.
(cc) Pileus with grayish, fuscous or brown shades.
(d) Pileus 3-7 mm. broad, whitish except the fuscous-brown center. 881. *O. schwartzii* Fr.
(dd) Pileus usually larger.
(e) Gills broad, crowded; pileus and stem dark, umber-fuscous to blackish. 884. *O. umbratilis* Fr.
(ee) Gills rather narrow.
(f) Pileus dotted with scurfy-blackish points; on sphagnum. 877. *O. gerardiana* Pk.
(ff) Not with blackish points.
(g) On decaying wood, logs, stumps, etc.
(h) Pileus rugose, brown; flesh emitting watery juice when cut. 874. *O. rugosodisca* Pk.
(hh) Pileus even, ashy to smoky, non-hygrophanous. 875. *O. epichysium* Fr.
(gg) On the ground, pileus hygrophanous, substriate; gills subdistant. 876. *O. onisca* Fr.

Section I. Collybiariae. Margin of pileus at first incurved.

**Gills narrow; crowded, close or subdistant.*

869. Omphalia scyphoides Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 75, Fig. 2.
Patouillard, Tab. Analyt., No. 419.

"PILEUS 4-8 mm. broad, umbilicate then infundibuliform, often

irregular, *pure white,* even, silky. FLESH submembranaceous. GILLS decurrent, *narrow, crowded, white.* STEM 8-16 mm. long, *short,* stuffed, subvillose, white. SPORES 6 x 2 micr. (Sacc., Massee); 6 x 4-5 micr. (Pk.)

"Gregarious, in mossy, grassy places on the ground. (Dead leaves in woods—Longyear.)

"Variable, often flexuous and eccentric, commonly small, not hygrophanous, yellowish on drying, stem woolly at least at base, pileus sometimes often an inch broad."

Reported by Longyear. Greenville. July. Rare.

870. Omphalia scyphiformis Fr.

Epicrisis, 1836.

Illustration: Fries, Icones, Pl. 75, Fig. 3.

PILEUS 5-9 mm. broad, convex, then umbilicate or infundibuliform, glabrous, sometimes silky, *dull white,* margin obsoletely striatulate. FLESH membranaceous. GILLS decurrent, thin, *narrowly triangular,* whitish, close, moderately broad in middle, attenuate at ends, edge entire, trama of interwoven hyphae. STEM 1.5-2.5 cm. long, equal, even, somewhat hollow, whitish, glabrous or loosely pubescent by flexuous longish hairs, base attached to moss by radiating hairs. SPORES 6-7 x 3.5-4 micr., ovate or pip-shaped, pointed at one end, smooth, white. CYSTIDIA none. ODOR none.

Gregarious on mosses or on moist earth. Ann Arbor. August. Rare.

This species is closely related to *O. scyphoides.* It differs in the dull white (albidus) color of the whole plant, whereas *M. scyphoides* is said to be pure white (candidus); the gills are not as narrow and crowded as in that species, and probably the spores differ. Our plants approached *M. scyphoides* in the pubescence toward the base of the stem, which Fries says is glabrous. On moss the silky-webby mycelium sometimes spreads some distance.

871. Omphalia olivaria Pk.

N. Y. State Mus. Rep. 25, 1873.

PILEUS 6-15 mm. broad, convex, subclavate, with decurved margin, *deeply umbilicate,* glabrous, *pale yellowish* to olive-green, even or obscurely striatulate. FLESH thin. GILLS long decurrent,

subdistant, *rather narrow, yellow* when fresh, edge entire. STEM 2-2.5 cm. long, 1 mm. thick, *tough,* equal, even, tubular, *dusky yellowish,* minutely pubescent, glabrescent. SPORES 6-7 x 5 micr., subglobose or broadly elliptical, smooth, white.

On decayed logs. Ann Arbor. September. Rare.

The plant revives somewhat after being moistened. The pubescence of the stem is white after the escape of the moisture. The trama of the gills is composed of interwoven, narrow hyphae, quite compactly arranged. *O. luteola* Pk. differs in having a brown and solid stem. *O. subclavata* Pk. has yellow gills, but the pileus is grayish-brown and stem white.

872. Omphalia lilacifolia Pk.

N. Y. State Mus. Rep. 24, 1872 (as *O. lilacina*).
N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, N. Y. State Mus. Rep. 24, Pl. 1, Fig. 10-13.

"PILEUS 1-2 cm. broad, convex, deeply umbilicate, *glabrous, viscid,* hygrophanous, dingy yellow with greenish tinge and striatulate when moist, bright sulphur-yellow when dry. GILLS decurrent, arcuate, close, narrow, *pale lilac.* STEM 1-2.5 cm. long, 1-2 mm. thick, equal, glabrous, hollow, *viscid,* yellowish, *with a pale lilac-colored mycelium* at the base. SPORES subelliptical, 5-6 x 3 micr."

Scattered or solitary, rarely subcaespitose, on decaying trunks of hemlock, in the coniferous regions of the State. Munising, Houghton, Huron Mountains, Bay View, New Richmond. July-September. Infrequent.

The colors and viscidity make this an easily recognized species. *O. lilacina* was described from Lapland, and anteceded Peck's first name; it is said to be violaceous except for the yellow gills; its cap is not viscid.

873. Omphalia pyxidata Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 194.
Patouillard, Tab. Analyt., No. 636.

"PILEUS 1-2 cm. broad, convex, umbilicate to infundibuliform,

glabrous, hygrophanous, *brick red or reddish-brown and radiate-striate when moist,* paler and silky when dry. FLESH membranaceous. GILLS decurrent, *narrow, subdistant,* tinged with flesh color then gilvus. STEM 2-3 cm. long, 2 mm. thick, equal, tough, glabrous, even, stuffed or hollow, *pallid rufescent.* SPORES ovoid, smooth, white, 6-8 x 5 micr. (Patouillard.)

"On the ground, roadsides, etc." East Lansing, on the campus. Reported by Longyear.

Evidently rare. Peck says he found it but once. Not much reliance can be placed on the spore-measurements given; Stevenson quotes three different sizes, one of which is followed by Saccardo. The pileus is said by Fries to fade strongly, even to become whitish. Some think that *O. muralis* Fr. and *O. hepatica* Fr. are to be considered as varieties of *O. pyxidata.* (See Barbier, Bull. 1, Soc. Myc. de France, Vol. XX, p. 105, 1904.)

874. Omphalia rugosodisca Pk.

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-2.5 cm. broad, broadly convex or nearly plane, depressed or umbilicate, sometimes obtuse or slightly umbonate, *rugose,* hygrophanous, *watery cinnamon-brown* and striatulate (moist), paler when dry. FLESH thin. GILLS short-decurrent, *narrow,* close, whitish. STEM 2-3 cm. long, 1-2 mm. thick, glabrous, hollow, cartilaginous, concolor, paler at apex. SPORES elliptical, 6-7 x 4-5 micr., smooth, white.

On decaying prostrate trunks of hemlock. Bay View. July.

Known by the rugose cap, the brown color and the fact that every part of the plant emits a watery juice when cut or bruised. It seems to be limited to decaying wood of coniferous trees. Peck referred this species to Collybia in the 31st New York Museum Report, but later returned it to Omphalia. Saccardo placed it in the genus Mycena without giving any reason for doing so. At times the odor is said to be slightly of radish.

875. Omphalia epichysium Fr.

Syst. Myc., 1821.

Illustrations: Atkinson, Fig. 101, p. 101, 1900.
Plate CLXXI of this Report.

PILEUS 1-4 cm. broad, convex then expanded and umbilicate or umbilicate-infundibuliform, margin arcuate with decurved edge, *striatulate and dark cinereous to smoky-brown* (moist), even, silky and light gray to whitish (dry). FLESH thin, soft. GILLS acuminate-subdecurrent, ascending-arcuate, *narrow*, close, thin, *whitish-cinereous,* edge entire. STEM 1.5-3 cm. long, 1-3 mm. thick, equal, glabrous, *almost solid* or subfistulose, *smoky-cinereous,* concolor within. SPORES 7.5 x 4 micr., pip-shaped, smooth, white. CYSTIDIA none.

On decaying logs or remains of decayed wood in frondose or mixed woods. Throughout the State. Ann Arbor, New Richmond, Marquette and Houghton. July-September. Infrequent.

The pileus is often fibrillose-floccose on the umbilicate center. The plants are rather soft and watery and the stem soon shrivels. *O. onisca* Fr. differs in the hygrophanous pileus which is entirely glabrous, the smaller size and large spores; the gills are somewhat different in shape and spacing.

876. Omphalia onisca Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 75, Fig. 3.
Cooke, Ill., Pl. 209.

PILEUS 5-15 mm. broad, convex, soon plane and cyathiform-umbilicate, *glabrous,* flaccid, *hygrophanous*, smoky-fuscous or ashy-brown and striate on margin (moist), pale cinereous and hoary (dry), the umbilicus darker. FLESH thin, concolor when moist, pale grayish-white when dry. GILLS *short, decurrent,* broadish in middle, *subdistant,* thickish, cinereous-fuscous, sometimes forked, edge entire. STEM short, 1-1.5 cm. long, .5-1 mm. thick, slender, equal, toughish, firm, solid, *concolor,* glabrous, becoming pale within. SPORES 9-11 x 5 micr., distinctly *orate,* apiculus curved, smooth, white. CYSTIDIA and sterile cells none. BASIDIA

clavate, 30-35 x 4-5 micr., 4-spored, sterigmata slender, 6-7 micr. long. ODOR and TASTE none.

Scattered or gregarious on the ground, in low, wet places in woods. Ann Arbor. May and September. Rare.

Differs from *O. epichysium* by its habitat on the ground, its glabrous, hygrophanous pileus and by its gills and spores. The hymenium occasionally has sterile basidia intermixed, bearing only a single long abortive sterigma. Authors disagree as to the size of the spores. Britzelmayr gives them as 12 x 7-8 micr. and Massee as 6 x 5 micr. It differs from *O. umbratilis* in the rather distant gills and larger spores.

877. Omphalia gerardiana Pk.

N. Y. State Mus. Rep. 26, 1874 (as Clitocybe).

PILEUS 10-20 mm. broad, nearly plane or soon infundibuliform, hygrophanous, fragile, *grayish-brown to brownish-ashy and striatulate* (moist), paler when dry, *the surface is dotted by scurf-like scattered points which become blackish.* FLESH thin, concolor. GILLS decurrent, *narrow*, subdistant, whitish then tinged with ashy or obscure yellowish, sometimes forked. STEM 3-5 cm. long, 1-2 mm. thick, *cartilaginous*, equal, even, hollow by a narrow tubule, glabrous or pruinose-villose toward base, *at length darker than pileus.* SPORES 7-11 x 3.5-4 micr., variable in size, maturing slowly, oblong-ovate, narrow, smooth, white. CYSTIDIA none. ODOR none.

On sphagnum in cedar and tamarack swamps. Ann Arbor, Houghton. May, July. Local.

Differs from *O. sphagnophila* Berk., in color and spores, according to the description. Cooke (Ill., Pl. 289) gives figures which are very like our plants. *O. sphagnophila* is said to have a dingy pale ochre-colored pileus and gills, is tough, and has smaller spores. Peck vacillates in deciding whether this is an Omphalia or Clitocybe; it was originally described as a Clitocybe, then in the 45th Report it was placed among the Omphalias, finally in the list of species described by Peck (N. Y. State Mus. Bull. 131), it was referred back to Clitocybe. My collections indicate that it has mostly a distinctly cartilaginous stem, hence it is placed here. The color varies considerably during its development; in old specimens the whole plant becomes dingy dark brown. The scurfy points on the cap are somewhat as in that of *Clitocybe ectypoides* Pk.

****Gills broad, distant.***

878. Omphalia albidula Pk.

N. Y. State Mus. Rep. 49, 1896.

PILEUS 3-8 mm. broad, *convex-hemispherical,* at times papillate, with or without an umbilicus, glabrous, striatulate, at first pure white, then dingy. FLESH membranaceous. GILLS decurrent, *distant, broad,* white, then dingy. STEM *very slender,* 1-4 cm. long, .5 mm. thick, *toughish,* glabrous above, white, "solid," attached below to leaves, etc., by a very strigose base. SPORES 8-10 x 2-4 micr., elongated-oblong, on slender sterigmata, 4-5 micr. long, smooth, white.

On leaves and bark in frondose or mixed woods. Bay View. July. Rare.

Related to *O. stellata* Fr. which differs mainly in its fragile stem, diaphanous pileus and different spores. *O. papillata* Pk. seems to be very similar, but with a conic or campanulate cap, few gills and different spores; it is said to be pure white.

Section II. Mycenariae. Margin of pileus at first straight, appressed to stem.

879. Omphalia gracillima Fr.

Epicrisis, 1836.

Illustrations: Fries, Icones, Pl. 75, Fig. 5.
Cooke, Ill., Pl. 252.
Gillet, Champignons de France, No. 502.
Plate CLXXI of this Report.

PILEUS 3-10 mm. broad, at first campanulate, becoming *hemispherical,* sometimes *papillate,* sometimes depressed, *snowy-white,* pellucid-striate, soon sulcate, glabrous, subflocculose when dry, fragile. FLESH membranaceous. GILLS decurrent, *triangular, broad,* subdistant to distant, thin, pure white, edge fimbriate. STEM filiform, 2-5 cm. long, .5 mm. thick, equal, tubular, minutely subpruinose, *white* like pileus, toughish, flaccid, attached by floccose base or almost inserted. SPORES 6-8 x 3-4 micr., *oval-lanceolate,* apiculate, smooth, white. CYSTIDIA and *sterile cells* none. BASIDIA 24 x 6 micr., 4-spored.

Gregarious among and on fallen leaves and grass in frondose woods. Ann Arbor, Marquette. Spring and autumn. Infrequent.

A very pretty little plant as its snowy-white color shows against a background of leaves or grass in open woods. The sulcate character of the margin of the cap appears as the plant loses moisture; sometimes a slight papilla is present. The gills are quite distant at times, with shorter gills alternating. Under the microscope the stem is seen to be covered with very short hair-like cells which under a hand-lens appear only as a slight pruinosity. The trama of the gills consists of interwoven hyphae. Our plants were not attached by floccose hairs as shown in Cooke's figures, but were almost free of them.

880. Omphalia fibula Fr.

Syst. Myc., 1821 (c. syn.).

Illustrations: Cooke, Ill., Pl. 274.
Gillet, Champignons de France, No. 500.
Patouillard, Tab. Analyt., No. 110.
Hard, Mushrooms, Fig. 99, p. 134, 1908.

PILEUS 3-8 mm. broad, subhemispherical or *cucullate,* often not expanded, *subumbilicate,* obscurely striatulate, nonhygrophanous, *pallid ochraceous-orange,* fading, even when dry, minutely pubescent under lens. FLESH thin, pallid. GILLS arcuate-decurrent, *narrow,* close (or subdistant after expansion of pileus), rarely forked, subpruinose, whitish or creamy-yellowish, edge entire. STEM 2-5 cm. long, *scarcely 1 mm. thick,* equal, flexuous, at length subtubular, toughish, *whitish or with tinge of yellowish* or straw color, scarcely pubescent under a lens, cartilaginous when dry. SPORES elongated oblong, 4-6 x 2 micr., smooth, white. CYSTIDIA scattered on sides and edge of gills, narrowly fusiform-acuminate, sometimes capitate, 3-4.5 x 7-9 micr. ODOR and TASTE none.

On *mosses,* in low woods or moist places. Throughout the State. May-October. Common.

This is our commonest Omphalia, although often only several specimens are found in one place. Its cap is at the very first almost cylindrical, then the margin turns out like the brim of a hat, so that it has much the shape of a man's "high silk hat;" hence it is said to be cucullate. Under the microscope the stem and cap are

found covered with hyaline hairs, 50-60 micr. long. The gills are narrow and deeply decurrent, running up the inside of the unexpanded cap and down below it on the stem. The cap often becomes top-shaped instead of cucullate. Stevenson (British Fungi) and Massee (Fungus Flora) say the gills are broad, a statement which is clearly an error.

881. Omphalia schwartzii Fr.

Epicrisis, 1836 (as var. of *O. fibula*).

Illustrations: Patouillard, Tab. Analyt., No. 420.
Gillet, Champignons de France, No. 504.

PILEUS 4-7 mm. broad, *rather firm,* soon campanulate, obtuse or at first umbonate, at length slightly umbilicate, even or striatulate, subpruinose, *whitish* with a slight fuscous tinge, *disk fuscous-brownish.* FLESH thin, pale fuscous. GILLS adnate-decurrent to strongly decurrent, arcuate, moderately broad, subdistant, whitish. STEM 2-3 cm. long, filiform, hollow, equal, pallid below, *tinged violaceous above,* pruinose, even. SPORES oblong-elliptical, 5-6 x 2.5-3 micr., smooth, white. CYSTIDIA on sides and edge of gills, *scattered,* subventricose, subcapitate at apex, some cylindrical above, 40-45 x 9-12 micr.

Gregarious on moss (Mnium, etc.) in hemlock woods. New Richmond. June. Infrequent.

O. schwartzii is constantly distinct from *O. fibula* to which Fries joined it as a variety. Peck (45th Rep. N. Y. State Mus.) considered it an independent species. Patouillard (Tab. Analyt.) had already pointed out that it was distinct from Bulliard's *O. fibula,* giving figures of spores and cystidia as evidence. It seems to be limited to regions of coniferous forests.

882. Omphalia fibuloides Pk.

N. Y. State Mus. Rep. 24, 1872.

"PILEUS 1-2 cm. broad, convex, deeply umbilicate, glabrous, hygrophanous, *dull orange* and striatulate when moist, paler when dry. FLESH thin. GILLS strongly decurrent, arcuate, rather close, *white,* the *interspaces venose.* STEM 3-5 cm. long, scarcely 2 mm. thick, equal, *glabrous,* hollow, colored nearly like the pileus. SPORES *elliptical,* 7.5 x 5 micr."

On moss. Jackson County. June.

Reported by Longyear. It is unknown to me. It is said to occur on burned, mossy ground like *O. fibula*, "which it resembles in color, but from which it may easily be distinguished by its much larger size, more robust habit and venose interspaces; the spores also are larger than in that species."

883. Omphalia campanella Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 273.
Michael, Führer f. Pilzfreunde, Vol. III, No. 67 (as *O. fragilis*).
Hard, Mushrooms, Pl. 17, p. 131.
White, Conn. State Geol. & Nat. Hist. Surv., Bull. 3, Pl. 16, p. 36.
Murrill, Mycologia, Vol. 4, Pl. 8, Fig. 10.
Plate CLXXII of this Report.

PILEUS 8-22 mm. broad, convex-campanulate, expanded, *umbilicate,* glabrous, striatulate to the umbilicus, *dull orange-yellow* or tinged reddish, watery when moist, paler when dry. FLESH thin, membranaceous, yellow. GILLS adnate-decurrent to deeply decurrent, arcuate, *thick, very veiny,* narrow, tapering to front, *subdistant to distant,* pruinose. STEM 1-4 cm. long, 1 mm. or less in thickness, *horny-cartilaginous,* minutely tubular, curved or straight, even, *dark rufous-bay to date-brown,* yellowish above, concolor within, glabrous above, pruinose elsewhere and *with fulvous strigose hairs at the slightly thickened base.* SPORES oblong, 6-7.5 x 3-3.5 micr., smooth, white. CYSTIDIA widely scattered on sides of gills, more abundant on the edge, subcylindrical or sublanceolate with obtuse apex, 50-55 micr. long. BASIDIA 30-32 x 4-5 micr. ODOR mild. In dense and spreading clusters on hemlock and pine logs, stumps, etc.; also on tamarack logs, stumps or their remains in the southern part of the State; sometimes on debris on the ground.

Throughout the State; collected from Detroit to Isle Royale in Lake Superior. June-November. (Earliest collection May 6.) Common on coniferous wood.

The Bell-omphalia is a striking and easily recognized plant because of its habit of forming extensive clusters, by its colors, and by its horny stem and veined gills. In the non-coniferous regions it

appears on tamarack and perhaps always on remains of wood of coniferous origin. Here it shows a marked variation from the typical plant as it appears on pine and hemlock; the gills are distant, always pruinose, and the stem is also pruinose and often solid. The typical stem of the plant from coniferous regions is usually attenuated below, but in the plant of the non-coniferous regions the stem is equal. The plants of non-coniferous regions are larger and the surface of the cap somewhat rivulose. Hard has illustrated a species (Mushrooms, Figure 98, p. 123, 1900) which he refers to *O. caespitosa* Bolt. It seems probable that this is a var. of *O. campanella,* perhaps var. *terrestris* Quel. Peck says its mycelium is regarded as destructive to the wood of coniferous trees.

884. Omphalia umbratilis Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 77, Fig. 3.
Cooke, Ill., Pl. 274.

"PILEUS 2-2.5 cm. broad, campanulate to convex, then *umbilicate,* glabrous, hygrophanous, *umber-fuscous* (moist), hoary when dry, margin somewhat striate. FLESH submembranaceous. GILLS adnato-decurrent, *broad, crowded,* becoming fuscous. STEM 2-5 cm. long, 2 mm. thick, equal, *tough,* stuffed then tubular, glabrous, *dark fuscous to blackish.* SPORES 6-7 x 4-5 micr." (Britz.)

Reported by Longyear. Chandlers. June. Rare.

Said to be gregarious on the ground, and imitating in color the blackish species of Collybia, like *C. atratus* and *C. ambustus.*

MUSHROOM POISONING

BY O. E. FISCHER, M. D.*

No one who has not followed the development of the study of mycology in its scientific or popular fields during the last twenty years can realize its development and the changes in our views that have taken place. Within this time a number of popular works have appeared, keeping pace with the great volume of general nature literature. Mycological and toadstool clubs have been organized in many cities in order to interest people in this fascinating branch of botany. Such clubs have easily won the interest of people at large because of their appeal on the score of mycophagy, the eating of fungi. In the purely botanical and technical field, colleges, universities and state herbaria have given more and more attention to the scientific and economic aspects of mycological study and have brought about the publication of journals devoted exclusively to studies made in these specialties. For centuries almost every community has had its enthusiastic amateur botanist who has collected and sought to name—to classify—the higher plants of his hunting ground. Now cometh also the humble collector of toadstools and mushrooms who finds that his hobby meets with sympathy and interest. Thus "The Spectator" in Outlook (January 13, 1915) gives a charming account of his initiation into the accuracies and delights of mycology.

It has been the purpose of Dr. Kauffman to supply in these volumes a manual for the use of both the amateur and advanced student of the Agaricaceae or gilled fungi of Michigan. It is similarly the purpose of this chapter on mushroom poisoning to place before layman, mycologist, mycophagist and physician an account of the present state of our knowledge of the subject. Having in mind such a varied class of readers, the author must include matter which will seem hopelessly technical to the one, and matter that may seem superfluously simple to the other. It is not the purpose of the paper to present much that is either new or original but it does

*The author would acknowledge his thanks to the libraries of Parke, Davis & Co., to the University of Michigan and to the Wayne County Medical Society, as well as to Professor Kauffman and to numerous private correspondents and co-workers whose services have aided in the preparation of this paper. Our knowledge of mushroom poisoning is still far from complete and further aid from any source will be welcomed.

Detroit, Michigan, 507 Field Ave., March, 1915.

seem possible, in the light of recent advances, to record more vital information about deleterious and suspected species than is to be found in similar articles in all the text books combined. The strictly technical literature of the subject is very large. A bibliography might easily include one hundred books and papers in French, German and English. Most of these are quite inaccessible to the average student and an attempt is made herein to present part of the matter they contain. No popular handbook covers a tenth of the field. The earliest views, still popularly held, regarded the Agarics as a large group of poisonous plants. Then, under the influence of teaching-mushroom-clubs and the invaluable published results of Peck and of McIlvaine and Macadam, the impression that there were but few deleterious and hundreds of edible species, has led to a reckless mycophagy which resulted in the discovery of new harmful species. These can no longer "be counted on the fingers" (Plowright), nor will Bagnall's "dozen in over a thousand edible" include all the toxic species. The bibliography, On Mushroom Poisoning, will guide the reader to the sources found most useful in the preparation of the paper.

A number of factors give myco-toxicology or mushroom intoxication increasing importance. The daily press endeavors to keep alive the fear of "mistaking a toadstool for a mushroom" in its frequent reports of the disastrous consequences of such a blunder if the toadstool is eaten, but the Sunday paper is not so consistent inasmuch as it prints and reprints irresponsible articles or quotes unreliable and dangerous rules and tests to apply, which, if followed, will lead the man of newspaper education into real danger. The enormous influx of foreigners from southern Europe, accustomed to seeing in the markets and gathering and eating certain species of higher fungi at home, gives us individuals who mistake some American deleterious species for an edible European one which resembles it. These people furnish most of the cases of poisoning which occur in the United States. It is affirmed that nearly all of more than thirty deaths from mushroom poisoning in and near New York City in 1911 occurred among them[39].* Through the growth of nature and mycological clubs, the sale and use of the several excellent popular books and bulletins, and the offering of wild species for sale in our markets, the use of fungi for food is rapidly increasing. This necessarily means that a larger number of poisonings of both major and minor importance will come about, since insufficiently trained, self-constituted "experts" may blunder

* For numerical references see bibliography: On Mushroom Poisoning.

or fall into minor error. Some reasons for even the well trained student going a bit wrong will appear in other paragraphs. If he will but report his error in the manner indicated below much, or even all, may be forgiven or even approved.

Mushroom poisoning must have been fairly frequent in early times since it is well known that the Romans employed fungi in great quantity both as delicacies and as daily food. Paulet, in 1793, records their collection in Russia, China, Hungary, Italy and especially in Tuscany, and their public sale in Pekin, Petrograd and Florence. Thus they have numbered among their victims the family of the Greek poet Euripedes, a wife, two sons and a daughter, Pope Clement VII, Emperor Jovian, Emperor Claudius, King Charles VI of France, and Czar Alexsis of Russia[1]. The Princess of Conti nearly lost her life through mistaking *Amanita muscaria* for *A. caesarea*. Definite knowledge of the number of fatalities from mushrooms begins with Paulet who states that from the year 1749 to 1788 there were a hundred deaths in the environs of Paris alone. More recently (1883) Bardy reported 60 cases in 6 years in Les Vosges, and Guillard (1885) estimated 100 deaths annually in southwestern France. Falck collected 53 cases in Germany with 40 deaths and Inoko in Japan reports 481 cases of mushroom intoxication in 8 years (1889). In this country Palmer, of Boston, collected 33 cases with 21 deaths and Forster, of Charlestown, 44 cases with 14 deaths[1]. Bagnall[2] quotes Clark and Smith to the effect that in one ten-day period (September, 1911), 22 deaths occurred in New York City and vicinity, 15 in 1906 and 30 cases with 12 deaths in 1905. In 1913 there were 26 cases of poisoning in Hartford in a few weeks. In 1900 Gillot found over 200 authentic cases of mushroom poisoning mostly in France (123 fatal due to *Amanita phalloides*) and Ford[3] added nearly as many more recorded in the German, English and French literature since 1900. Sartory, in France, records for the summer of 1912, 249 cases of fungus poisoning with 153 deaths. Of these 90% occurred in 15 days[1]. Ford is convinced that the majority of cases do not find their way into medical literature. I do not believe that 10% do. Thus in one summer there were unreported 2 cases (not fatal) in Baltimore, 2 deaths in Cleveland, 9 poisoned in Fostoria, Ohio with several deaths, and 10 in Toronto with 2 deaths. Murrill[7] estimates the annual deaths in the United States as probably 50 or more, as many are not reported. My own records, by no means complete, for southeastern Michigan only, for 10 years show 77 cases with 16 deaths. None reported medically. Most cases undoubtedly escape publicity.

AMANITA PHALLOIDES

(See *A. verna, virosa* and *bisporiger.*)

Amanita phalloides is by long odds the most important of all poisonous mushrooms. It is widely distributed, common throughout most of the season and often exceedingly abundant. It is innocent in appearance, of delicious taste and of extreme toxicity. In considering it we may regard *A. verna, A. virosa* and *A. bisporiger* as included under the term "*A. phalloides.*" Bulliard a hundred years ago gave it the common name "Destroying Angel." It is also known as the Death Cup, White or Deadly Amanita. The earlier species, named in Europe, such as *Amanita bulbosa* and its varieties, *alba, citrina, virescens* and *olivacea, Agaricus bulbosus, Amanita viridis, A. venenosa* and a number of others are without doubt identical. In older French literature it is known as *l'orange cigue, l'orange souris, l'orange blanche ou citronee, l'orange cigue jaunâtre* and *l'argaric bulbeux* and in German as *Giftwulstling* and *Knollenblaetterschwamm.*[1] Its identification is comparatively simple even in its disguises and no one who does not know this fungus well should dare to eat wild mushrooms or to recommend a portion of such to his neighbor. The possibility of its presence in a collection intended for the table should always be rigorously excluded. The 153 deaths of 1912, above mentioned, were due chiefly to *A. phalloides.* Gillot's thesis[4] maintains that all fatal cases are due to this Agaric. This is not strictly true. The statement that nine-tenths of all fatal cases are due to it, seems conservative enough. In 1845 Orfia reported 8 ill and 4 dead from its ingestion; Bock Ziemssen, 11 fatal cases; Mautner (1861), 4 cases with one death; Handford (Lancet, 1886), 2 fatal; Palmer, 16 cases, 7 fatal; Tappeiner, 5 cases, 2 fatal; Pfromm, 4 Italians, all died; Plowright, 6 cases, 4 fatal; Bulletin of French Mycological Society, 18 deaths 1900-07; in October, 1884, eleven children died in an orphanage in 5 days. Incomplete records for southeastern Michigan (10 years) show 16 deaths in 44 due to *phalloides* illnesses. In 22 of this 44 the white the Amanita was surely to blame, in 14 probably, in 5 presumably.

Surprisingly small quantities may bring on fatal consequences

and there are numerous deaths on record from eating one or two good-sized specimens.[1] Plowright[5] has reported the death of a child of ten years from one-third of the top of a small plant eaten raw; Pfromm, that of two children after taking a bit of juice soaked into bread.

The mortality from *A. phalloides* intoxication is extremely high, varying from 60 to 100 per cent and is dependent largely upon the amount ingested and probably somewhat upon the treatment.[1] Sixty to one hundred percent seems too high for adults, judging from local cases. One-half this would be more nearly correct, unless much is eaten or several children are included in each group. Recovery may be regarded as rare but not impossible. It may follow eight to twenty-one days of extreme suffering. Practically all deaths from mushrooms are attributed to this one species.

The cruelty of the poison and the horrible suffering it causes its victim may be faintly realized from a perusal of the clinical histories of the more fully reported cases. One gets the impression that scarcely another agent bears equal power to torture. A few typical, though varied, cases may be briefly quoted. Thus an Italian family at 6 p. m. on Sunday ate heartily of a cooking of fungi. By midnight vomiting had begun, attended by violent abdominal pain, headache and extreme thrist. A doctor was summoned the next morning. The father was cyanotic and twitching and delirious. The pupils were contracted. He improved slightly for a few hours. Periodical remissions and exacerbations of symptoms continued for eight days when coma and death supervened. The mother presented similar symptoms, with thirst and vomiting more violent, miscarried at five months and also died on the eighth day. Both children died in 58 hours. (Pfromm.[6])

The Deep Valley, Pennsylvania, cases occurring in August, 1907, are of especial interest.[5] About 7 p. m. on Sunday a physician, three others and the man-of-all-work ate one quart of mixed fungi fried in flour and butter. Before 2 a. m. all began to suffer from excessive vomiting and violent diarrhea which continued all day Monday. Atropine, narcotics and an oil purgative were given. The gastrointestinal symptoms continued three days accompanied by subnormal temperature, more or less delirium (no salivation or urinary suppression) and in case of Dr. D., severe muscular cramps of limbs and abdominal muscles. His death occurred on Thursday morning. By Saturday the man-of-all-work was up and about, the three others still abed. In these, vomiting and diarrhea had ceased and an enlarged liver, distended gall bladder and jaundice were appear-

ing. The man who had gathered the fungi conducted the investigator to the place and indicated the varieties gathered and what had constituted most of the lot. These were *Amanita phalloides,* with smaller numbers of Cantharellus, *Amanitopsis vaginata* and a very few *Russula emetica.*

The following group of cases is very typical. In September, 1911, six persons were poisoned, two fatally, in Cleveland. The children, aged four and six, had a little gravy and recovered after nausea, vomiting and diarrhea. Mr. C., aged 67, ate some at supper, felt bad during the night but ate more for breakfast! About noon violent illness began with intense pain in the epigastrium, vomiting and diarrhea with loss of control, clonic spasms and great prostration. Urinary suppression was obstinate and lasted till death, three days after the first meal. Mrs. C., aged 65, ate one forkful at the first meal but did not like the taste. Profuse vomiting and diarrhea with great prostration began one hour after Mr. C.'s symptoms. She recovered rapidly after two days. The daughter-in-law, aged 40, ate at the second meal and, though feeling hot and feverish, ate more at noon! Eight hours later she had exactly the same symptoms as Mr. C. The physician arrived early on the next day. He gave oil, began stimulations with strychnia, nitroglycerin, aromatic spirits of ammonia and, after removal to the hospital, saline solution continuously and oxygen. Some improvement was noted except that the heart action was weak and intermittent and the extremities could not be kept warm. Hiccough for two days, great agony and unconsciousness preceded death on the seventh day. A son, aged 19, ate the second meal—breakfast. Though feeling bad, he worked until 4 p. m. By 9:30 he presented the same symptoms as mother and grand-father. After ten days of apparently as grave illness as theirs under "most terrific stimulation" (nitroglycerin, strychnia, oxygen and salines) he was reported out of danger though "looking like a corpse." "The fungi were gathered from a shady hillside. Some were over six inches across and white inside and out; others were yellow as saffron through and through and about four inches across. Others were white outside and brown under; some were small, white on top and pink under."[9] The brief case histories leave no doubt as to *Amanita phalloides* being the offender. The botanical notes admit of considerable speculation. In every respect this report is pregnant with meaning—and full of food for reflection—for the student of toadstool poisoning.

Grouping the clinical histories from numerous sources the symp-

tomatology of *phalloides* intoxication may be described. When due to the deadly Amanita alone the clinical symptoms are practically always the same and are characteristic. Nevertheless IN EVERY CASE OF POISONING the etiology, i. e., WHAT FUNGUS HAS BEEN EATEN should by all means be determined at the earliest possible moment! Why? Not only for its scientific importance to myco-toxicology but more especially for guidance as to what treatment is indicated and required and very especially what the outlook may be for the patient. If *A. phalloides* can be ruled out the prognosis at once becomes very much better and useless fears may be allayed. The sufferer is entitled to this. Uneaten fungi should be submitted to competent authority, more should be gathered from the sources whence the suspected species were derived, and the opinion of the patient or of some one who gathered them with or for him as to their identity with those eaten, obtained.—Returning to symptomatology: After ingestion there is a prodromal stage of from six to fifteen hours—generally over ten—in which little or no discomfort is felt. Then follows a sudden seizure of extreme abdominal pain, cramp-like in character, accompanied by vomiting and diarrhea of undigested food, with blood and mucus. Discharges soon become cholera-like (serous) or rice-water in character. There is burning, consuming thirst. Anuria is usual; constipation rare. Prostration and sleeplessness, with the great nervous restlessness of weakness and suffering, are conspicuous. Muscular spasms in various groups are frequent, accompanied by cries or screams of pain. Loss of strength is rapid and excessive. Periods of pain and vomiting alternate with remissions and ameliorated symptoms. Haemaglobinuria does not occur. Within a few days jaundice, cyanosis and coldness of the skin and extremities develop followed by profound coma from which the patient does not rally. Ocular symptoms, the pupils varying, and convulsions are rare but may occur. Convulsions are often terminal, and death is due to cardiac failure. The course of the disease requires from four to six days in children and eight to ten in adults but death may occur within 48 hours if large quantities of the fungi have been eaten or they have not been thoroughly cooked. These points should be weighed in considering prognosis. The resemblance of the clinical picture to that of cholera and to acute yellow atrophy of the liver has often been remarked.

Atypical features occur especially in cases where *Amanita phalloides* was not proven to have been the sole etiological factor. Such cases may show dilated pupils, clear cerebration, albuminuria.[2]

Schuerer's six cases—most thoroughly studied and reported[10]—showed cramps in calf of leg, arms and other muscles, the left arm escaping in one. Many days of pains in the legs persisted. Recovery was more or less rapid according to age but the youngest (5) died in thirty-five hours after violent convulsions and coma. If recovery takes place the liver and spleen enlarge about the third day, after which day, according to Maass,[12] the prognosis becomes better. "In clear-cut cases the physician can diagnose the variety of toadstool from the typical symptoms."[10]

Reports on the post mortem findings in man in fatalities due to *A. phalloides* are not overly satisfactory. There is little to be found to account for the violent paroxysms of pain, vomiting and diarrhea. Schuerer found, in a child, colitis, pleural haemorrhages and fatty degeneration of liver, heart and kidneys. Microscopically there were "Very wide-spread and obviously severe lesions of the cell elements of the central nervous system, as heretofore hardly known in this form and to this extent"—regressive changes like those seen in the septic deliria. Harmsen, Maass and Kobert liken the postmortem findings to those of phosphorous poisoning. Thus, the normal liver contains from 8 to 25 per cent of fat, that of phosphorus and of alcohol poisoning 50 to 70 per cent and that of Amanita-toxin (2 cases) 53 and 69 per cent. Death seems to be due to this extreme fatty degeneration of the liver. (Ford, Schuerer.) Medico-legally, such a liver, with the addition of the other findings, makes the postmortem picture pathognomonic of *Amanita phalloides*.[10]

Treatment of Poisoning by *A. phalloides*

All authorities agree unanimously that therapeutic measures in these grave emergencies are almost useless. Case histories show that often the cause is not recognized, or the gravity of the cases not appreciated. There is no antidotal drug for Amanita-toxin and the treatment is that of poisoning and septic intoxication in general. Competent medical advice should be obtained as soon as possible. Active emetics (ipecac, mustard, apomorphine), assisted perhaps by the stomach-tube, purgatives (castor oil being preferable to the salines) should be administered at once and every effort thereby made to reduce further absorption of the poison to a minimum. By the time symptoms from *A. phalloides* have begun, the toxin is already in the circulation. High enemata to empty the lower bowel may be used early. Later normal saline solution should be given thus, or hypodermically, or even intra-

venously to supply the body's need for fluid and to ease the torturing thirst. Narcotics and anodynes in large doses are necessary to relieve the intense pain and to quiet convulsive movements. Nitroglycerine and strychnia frequently, and up to the limit of tolerance, are of great value. Cyanosis calls for oxygen inhalations. Atropine may be of use as a stimulant and a corrective with morphine *but it has no antidotal value here*. Milk, raw or boiled, may be regarded as a mild natural antidote.[18] Alcohol should probably not be given in any form. Strong coffee is indicated as are hot dry applications to the body. Digitalis may be used but requires from six to ten hours before effects are seen. Camphor[10, 30] in sterile oil given subcutaneously every hour is valuable. Suprarenal extract is mentioned. Large draughts of hot water, flaxseed tea, slippery elm or starch water[14] may be used, as well as tannigen, bismuth subcarbonate and opium to quiet excessive diarrhea and vomiting. Supportive measures and good nursing are of the greatest importance. Transfusion of blood would seem worthy of trial in graver, slower cases.

Ford, finding that protective and curative sera were theoretically possible, worked for three years on the serum-therapy. He was able to immunize animals to the aqueous extract up to five or six times the fatal dose[15] but efforts to manufacture a curative serum have thus far been unsuccessful.

The Fochier treatment by abscess of fixation[53] has been applied by Dr. A. Pic of the University of Lyon in 23 cases of which 9 died. The conclusion that "it is a therapeutic agent of the first order in those terrible intoxications due to *Amanita phalloides*" seems to have made no impression on the medical profession. Judging from Michigan cases—37 illnesses with 16 deaths—this is not a remarkably low mortality, 39 per cent versus 42. Pic and Martin contrast it with "the usual 86.8," based on 38 cases with 33 fatalities in France, 1913.

Poisonous Constituents of *Amanita phalloides*

The first attempt to obtain the active principle or poison of *A. phalloides* is probably that of Letellier, who in 1826 obtained a heat-resistant substance from a number of fungi. This was termed amanitin. Later he found two substances, one of an irritating nature, acting upon the mucous membranes of the alimentary canal and another characterized as a glucosidal alkaloid—the Amanitia. Boudier in 1866 ascribed the poisonous action to an

alkaloid which he named bulbosine, but was never able to isolate. In 1877 Oré concluded, on biological grounds alone, that *Amanita phalloides* must contain an alkaloid and this hypothetical poison he named phalloidin. These names are no longer employed. Kobert (1891) established the important fact that extracts of *A. phalloides* contain a substance which lakes or dissolves the red blood corpuscles of many animals and of man. With this "hemolysin" we shall have much to do in the remainder of this paper. Ford and his co-workers have investigated it most satisfactorily in their epoch-making labors which have been fully reported. This hemolysin is not the active principle—for we shall see that it is very easily destroyed by heat, much less than is usually employed in cooking, and that the digestive juices break it up as a rule. Furthermore, individuals dying of *A. phalloides* intoxication do not show symptoms which are to be ascribed to this kind of poison. Kobert gave this blood-dissolving hemolysin the name of phallin, regarded it as the essential poison, and gave it undeserved importance. He placed it in the group of protein-like poisons known as toxalbumins because of its susceptibility to destruction by heat. Beside the hemolysin, and more constantly present, Kobert found later an alcohol-soluble substance which was extremely poisonous to animals. This he regarded (1900) as an alkaloid, soluble in alcohol, which would not produce fatty degenerations. A toxalbumin (near thujon and pulegon), was held responsible for these.

Frey,[16] in 1912, comments, "The whole study of mushroom poisoning still lies very much in the dark. It is on the same plane as thirty years ago." He says that studies on muscarin and phallin show old results and theories to be wrong, but otherwise there is no progress. The publication of results of recent American investigators seems to have been unknown to him, for progress has been made, and a basis for further results established. Murrill[17] comments (1910) that it is remarkable how little is really known, and that the practical importance of the subject is vastly increasing. The important work of recent American investigators began with the proof (Ford[18]) that extracts of *Amanita phalloides* contain the hemolytic material described by Kobert and in addition a heat-resistant body which will reproduce in animals the majority of the lesions described in fatal cases of *A. phalloides* intoxication in man. These two substances were named by him the Amanita-hemolysin and the Amanita-toxin. The further chemical study upon the plant was carried out by Abel and Ford,[19] by Schlesinger and Ford,[20] and Ford and Prouty.[21] In these papers it was shown

that the hemolytic agent is not proteid (toxalbumin) but an easily-decomposed glucoside, insoluble in alcohol, extremely sensitive to heat, to small traces of acid, to pepsin and pancreatin, and that it can therefore play no role in poisoning in man when the fungi are cooked. It may be a factor if large quantities are eaten raw or insufficiently cooked, or if through deranged digestive action the hemolysin escapes destruction.[15] It is present in such great amount that under such circumstances the possibility of its having a poisonous action cannot be eliminated. The Amanita-toxin has so little in common with alkaloids that they hesitate to class it with them.[15] Amanita-toxin is the alcohol-soluble active principle, *the essential poison,* resisting the action of heat, of drying and of the digestive juices, and reproduces in animals the lesions found in *phalloides* intoxication in man. Chemically it cannot be characterized definitely, but the purest preparations do not give the reactions of either proteins, glucosides or alkaloids. Rabbits are not affected by various extracts by mouth, both the hemolysin and Amanita-toxin being quite innocuous to them, when one-fortieth of the amount was fatal when given subcutaneously. Dogs and cats are poisoned by the cooked fungus in the same degree as human beings. The raw hemolysin given subcutaneously has pronounced blood-dissolving properties, giving the picture of a hemolytic intoxication with extreme haemaglobinuria and pigmentation of the spleen.[13] [These are the properties assigned to the European *Helvella* (*Gyromitra*) *esculenta.*] Even when made from dried specimens of *Amanita phalloides* hemolysin will dissolve the red blood cells of guinea pigs, rabbits, fowls, pigeons, dogs, goats and man. Swine, sheep and beef bloods are not susceptible. The blood of the guinea pig is most susceptible and that of the goat least. When this hemolysin is heated to 140° F. it loses some of its activity, and 150° maintained for one-half hour, suspends it. (Hence the term "thermo-labile.") It may be classed with the bacterial hemolysins. Injection experiments on animals show its extreme toxicity. Within a few hours the fur ruffles and they refuse to eat. There is rapid loss of weight and strength, death occurring within one to three days under great dyspnoea. The heart stops last. In smaller doses a chronic intoxication is produced lasting three, four or six weeks. Convulsions are unusual and there is no salivation or gastro-intestinal disturbance—in contrast to muscarin poisoning.[18] Frequently, even in *A. phalloides*, the hemolysin is present only in small amounts and it may be absent whereas the edible *A. solitaria* and *A. rubescens* contain

it in great abundance. "It is probably a food and certainly harmless,"[3] i. e., when cooked and eaten by man.

The Amanita-toxin is the more active and acutely fatal, producing approximately the lesions seen in man from the whole cooked plant, ulcers in the stomach and intestine, serious hemorrhages, and in other organs, especially liver and kidney, cell necrosis and fatty degeneration.[13] It loses potency somewhat but not greatly on boiling. In a later report[31] Ford and Brush say that *Amanita phalloides* var. *citrina* gathered in France corresponds in all particulars to the *A. phalloides* gathered in America, and has identical properties and contains the same poisonous substances.

OTHER AMANITAS

Amanita verna and *A. virosa* have been already mentioned as included in the above section. *A. spreta* is recognized to be deadly poisonous. A group in which Amanita-toxin is present in small quantities includes *A. porphyria, strobiliformis, radicata, chlorinosma, mappa, morrisii, citrina,* and *crenulata.* The first four of this latter group are devoid of haemolysins but owe their toxicity to small amounts of Amanita-toxin. In *A. spreta* the hemolysin is small. The extract caused both acute and chronic intoxication in guinea pigs but not in rabbits. Poisonous, Boston Mycological Club, and Atkinson.

Ford and Sherrick[41] found in *Amanita mappa* a small amount of thermo-labile hemolysin, a chronic intoxication of guinea pigs closely resembling that of *Amanita phalloides.* No muscarin. Rabe says *A. mappa* has the same poisons as *A. phalloides* but in much smaller amount. It should be classed as perhaps less dangerous than *A. phalloides.* Other Amanitas may be grouped here by Ford's reports.[22] The agglutinin will receive attention in the account of *Amanita muscaria.* The chronic intoxication is shown by a progressive emaciation and death in 18 to 20 days.

Amanita citrina (of Europe) a yellow variety of *A phalloides* (Kobert). No hemolysin or agglutinin. Poisonous to guinea pigs and rabbits by both acute and chronic intoxication. Seldom, if ever, toxic to man.[18] A distinct species from *Amanita phalloides* var. *citrina.*

Amanita crenulata—No hemolysin or agglutinin. Chronic intoxication in guinea pigs and rabbits. Extract made after one year of drying was fatal by chronic action after an acute. Poison,

small in amount, similar to Amanita-toxin. McIlvaine records it as edible.

A. morrisii—Small amount of hemolysin destroyed at 60° C. Poisonous to guinea pigs and rabbits. Should be grouped with the deadly species. Edibility not tested.

A. chlorinosma is probably seriously poisonous. *A. strobiliformis* acts like *phalloides* on frog's heart.

The species of the genus *Amanitopsis* as a whole are regarded as edible. McIlvaine warns against confusing *A. spreta* with these species.

Amanitopsis volvata may be grouped with *phalloides*. No hemolysin or agglutinin, fatal in 7 to 22 days to guinea pigs and rabbits, the intoxication resembling Amanitas. McIlvaine pronounces it edible, but it should be avoided. *Amanitopsis vaginata* is easily learned and is edible.

Amanita junquillea—rare and unimportant—free from poisonous properties.

Amanita solitaria—difficult to recognize. Contains small amount of hemolysin. Edible, McIlvaine. Ford[32] reports it almost free from poisonous action on rabbits and guinea pigs, but large doses produced a salivation in the latter. *Muscarin is more widely distributed in fungi than was originally supposed.*

Amanita rubescens—commonly known as "The Blusher," Red Amanita. Non-toxic to animals and man. Free from Amanita-toxin but has a powerful hemolysin. European authorities differ but our American form is a well-known edible species.

Amanita frostiana—difficult to identify, is closely related *botanically* to *A. muscaria*, of which it has been regarded as a small or depauperate form. It contains a small amount of a thermo-labile hemolysin, but no muscarin. Its extracts have no effect on animals. Not tested but probably edible.[22] CAUTION! lest *A. muscaria* be used.

AMANITA MUSCARIA

Amanita muscaria, the Fly Agaric, is a most interesting fungus. It is also called "the false orange" and "Fliegen Schwamm." It is less common and less toxic than the group of *A. phalloides* but is widely distributed over the world. In importance it ranks next to the white Amanitas. It is subject to great variations in color, size and markings, but is easily learned so that it may be distinguished from the famous edible *Amanita caesarea*. Ford [3, 18] and Michael

and others agree that its taste is bitter and unpleasant and this factor may save people from serious accident. Occasionally the bitter taste is absent, more is eaten and quick fatality may result.

Through the publication[23] of Circular No. 13, U. S. Dept. of Agriculture and of Prentiss' account[24] the fatal poisoning of Count de Vecchii in November, 1897, has become classic. He bought from a countryman a quantity of *Amanita muscaria,* picked in Virginia, seven miles from the capital. The Count was familiar with mushrooms and took these to be the Royal Agaric, *Amanita caesarea.* At breakfast, which was finished at 8:30, he ate two dozen and pronounced the taste particularly good. Dr. K. ate one dozen. By 9 a. m. the Count was lying on his bed in a state of collapse, filled with a sense of impending death, and soon lost consciousness. Blindness came on before this, as did rigid spasm of the lower jaw, and difficulty in swallowing. Convulsions were so violent as to break down the bed. Emetics were given and apomorphine and atropine subcutaneously. He became continually worse and died without regaining consciousness on the evening of the next day. Dr. K. went by car to his office. While sitting on a chair, about 9 a. m., he gradually passed into unconsciousness without feeling any premonitory pain or distress, though half-stupid and very restless just before. He noted, about 9:10, uncertain eyesight and double vision, without nausea. A prominent early symptom was sudden jerking back of the head. He remained unconscious for five hours; at one time his life was almost despaired of. He did not suffer the least pain but on the contrary was in a comfortable dreamy state. By 7 p. m. he was out of danger. Cold sweats were a prominent symptom. A total of one-tenth grain of atropine was given in 24 hours. Apomorphine produced no emesis, vomiting not occurring until evening. Castor oil and sweet oil were given about noon.

THE CLINICAL FEATURES of poisoning by *Amanita muscaria* are quite as characteristic and distinctive as those in *Amanita phalloides* intoxication and should enable physicians to distinguish clearly between the two conditions—when either fungus is eaten alone. So often a mixed lot of different varieties is used that the symptoms in patients point to the combined action of different toxic principles. In *A. muscaria* poisoning there is usually a very short interval between ingestion and first symptoms, one-half to one hour or at most three hours. If small amounts are eaten even five or six hours may elapse. This feature is of greatest value

in deciding upon the kind of intoxication which the cases present. Severe ones show excessive salivation and perspiration, a flow of tears, a feeling of laryngeal constriction, nausea, retching, vomiting and watery diarrhea. The last named almost always occur. The pulse is usually slow and irregular. There is no fever; pupils are small. Respirations are accelerated and the patients dyspnoeic, the bronchii being filled with mucus. (The action of atropine is the opposite of this, point for point.) Mental symptoms are also present, particularly giddiness with confusion of ideas and rarely hallucinations. All these symptoms may vary in intensity, at some times the gastro-intestinal predominating, and at other times the mental. In light cases only salivation or perspiration may be noticed, with uneasiness in stomach and bowels, for a few hours. In severe cases the vomiting and diarrhea may rapidly rid the alimentary canal of the offending material and the nervous symptoms then become predominant—delirium, violent convulsions and loss of consciousness developing in rapid succession and the patient's sinking into a deep coma. Rarely, consciousness is retained till the end, death resulting from paralysis of the respiration. Finally, in many cases, after the vomiting and diarrhea, the patients sink into a deep sleep, awakening later profoundly prostrated but on the road to recovery. Normal health reappears rapidly—two or three days. There are no late effects in *muscaria* intoxication as in that of *Amanita phalloides* with its degenerative changes in the internal organs. The prognosis is always good if the patient recovers from the preliminary symptoms. When, rarely, the nervous symptoms dominate the alimentary, excitement and hallucinations simulate alcoholic intoxication. (Quoted freely from Ford and Clark.[25]) The delirium is occasionally followed by loss or impairment of memory. The pupils dilate as death approaches. The action of muscarin is almost identical with that of pilocarpin.

Post-mortem examination reveals surprisingly little. The pathology of *Amanita phalloides* is absent, particularly the lesions of the liver. In general the findings point to the action of a profound nerve poison.[3] Medico-legally, remains of fungi in the alimentary canal would be of great importance.

Poisonous Constituents of *Amanita muscaria*

Schmiedeberg and Koppe, in 1869, showed by the most careful work, both chemical and pharmacological, that *Amanita muscaria* contains an active principle which they called muscarin. At first regarded as an alkaloid of the same general nature as strychnine

and morphine, later work has shown that it is probably a complex ammonia derivative. Muscarin is an extremely active substance, well known from the attention it has received in all works on toxicology and materia medica and therapeutics. In the latter field it can well be spared on account of its variability and unreliability and because we have better drugs of similar action. Muscarin is near pilocarpin and nicotine in action, exciting smooth muscle and stimulating all glands. At almost every point in its action it is the direct antagonist of atropine (from belladonna) but is far less powerful. It is present in the fungus in but small amounts but is nevertheless able to exert its characteristic effects, frequently with fatal outcome. In producing paralysis of heart and respiration it does so by stimulating the inhibitory nerve endings of the vagus. Atropin has a depressing action upon the same nerves which muscarin stimulates. The muscarin excitement, remarkably, does not pass over into a paraylsis, its curare action (that of arrow-poison) being slight. Muscarin has been synthetically prepared by the oxidation of cholin but does not keep as well as the natural product, and differs materially in its action upon animals.[18] A ptomaine muscarin is also known.

But poisoning by *Amanita muscaria* and muscarin poisoning are by no means identical (Harmssen[26]). Kobert says the fly-agaric drunk (Fliegenschwamm Rausch) is by no means a pure muscarin "jag" but resembles haschisch (*Cannabis indica*). Harmsen found that he could extract from 100 g. of fresh *muscaria* 16 mg. of a fairly pure muscarin. This was twice as deadly to cats as to frogs. That it is not the sole factor in poisoning is shown from the following: (1) with the lethal dose of muscarin at 0.525 g., it would require 4 kg. (8.8 lbs.) of the fresh fly-fungus to produce a fatal outcome[26]; (2) when the action of the muscarin-part of an entire extract is physiologically neutralized by atropin, the animals nevertheless die; (3) the extract is deadly even when the muscarin is removed. He has also shown[26a] that the entire extracts of *A. muscaria* are twice as toxic, weight for weight, as pure muscarin and contain a poison which produces in animals continued convulsions with fatal outcome, not prevented by atropin. He therefore assumes the presence of at least one other substance which he names "Pilz-toxin." This pilz-toxin must be very unstable since it loses potency on drying, and is sensitive to heat (thermolabile). It does not appear in the urine. (Compare intoxication of the Koraks.) His work casts doubt over the value of atropin as an antidote and is in accord with clinical experience. In 1910 Ford[22] said *Amanita*

muscaria acts in all animal experiments as a convulsant and no other agaric shows similar action, not even the closely related *A. frostiana*.

Treatment for *Amanita muscaria* Poisoning

Just as in cases of *A. phalloides* intoxication, it is the important duty of physician and friends to get all the information possible as to the exact nature of the toadstool eaten and the amount ingested. *It will be shown below that a number of species of fungi, mildly toxic or simply deleterious and unwholesome, can produce a more or less typical picture of muscarin intoxication.* Confirmation of the species will therefore be of great value in determining prognosis and in giving a clew to antidotal treatment. The outlook in poisoning by the fly agaric is more hopeful than when the Destroying Angel (*A. phalloides*) has been ingested, the mortality runs much lower, the illness is briefer and the suffering less cruel—though bad enough. We do not have here the chronic and degenerative lesions produced by the white Amanita which defer death or prolong convalescence. The *muscaria* intoxication is acute, comes on soon after eating the fungus, develops rapidly and is amenable to treatment. Recovery often occurs without untoward symptoms. Lachrymation, salivation, contracted pupils, delirium, hallucinations, and coma call for atropin in large doses subcutaneously or intravenously. Even though the vomiting and diarrhea are pronounced, the stomach and bowels should be further emptied by the free use of emetics and purgatives, for parts of the fungus are often found in the canal post-mortem when profuse emptying seemed to have taken place. On account of coma, apomorphine subcutaneously is less apt to work, and other means of emptying the stomach should be begun early (stomach tube, mustard, zinc sulphate, sulphate of copper). In cases with bad heart action, respiratory distress and coma, atropin (intravenously) offers the only hope, though many other measures, as mentioned under *A. phalloides* treatment, should not be neglected. Absolute recumbent rest is enjoined. Sustain the heart. Give nitroglycerin for cold skin and extremities, and dry heat.[24] Atropin is not medically indicated in every case, and good nursing may easily be of greater importance to tide over periods of weakness and depression. Nourishment should be concentrated. Tannic acid is useless; acidulated water bad. Transfusion of blood, oxygen and galvanism, have been suggested.

The fly Amanita possesses interest in several other respects. It

is eaten in the Erzgebirge of Saxony and Bohemia.[11] Treated and untreated it has been eaten without bad results. A colored woman in Washington recited in detail how she was in the habit of cooking it. Rejecting gills and peeling the cap, specimens were boiled in salt water and then steeped in vinegar, then washed and cooked and served with steak, the whole process a rational process to remove poisons (?). Michael[27] worked up to eating a thick medium-sized cap (cooked) and "properly peeled." It tasted ill but did no harm. Then he ate a specimen prepared as salad which tasted worse. On this ground he classes it as "inedible." For reasons like this we are loath to take any one man's testimony in the great field of mycophagy. Peck has repeatedly received reports from various people who eat it.[54] He also records the eating of the fine variety *formosa* of *A. muscaria* by a sheep, but Ford[22] suggests that the herbivora are (at least, by mouth) immune to this toxin as well as to others. There seem to be *seasonable and local variations in the toxicity of Amanita muscaria*[55] *and of other species.*

One-tenth of a raw *A. muscaria* has produced in a man of thirty-seven years, eleven days of illness, with typical *muscaria* symptoms, but accompanied by fever.[56]

The use of *Amanita muscaria* simply and purely for producing drunkenness is well known, but has not been satisfactorily explained. Krasheninnikoff, who travelled in Siberia and Kamchatka for ten years (1733), reports that the Koraks used the fly Amanita—three or four for a moderate dose, and ten for a thorough drunk. Langsdorff (1803) confirms this and Kennan[28] describes it in some detail in his first Siberian journey. The natives call the fungus "muk-a-moor." Its sale has been made a penal offense by Russian law but "prohibition does not prohibit." One fungus may sell for $20 worth of furs, and supply does not equal demand. The dried cap is used; a duly flavored decoction is made from them or pieces are swallowed whole. First effects come on rapidly and make the candidate cheerful and merry, then drowsy and sleepy for ten or twelve hours and he awakes in a state of exhaustion. During the stage of excitement there is a horrible kind of delirium and the experience of visions of varied character. The intoxication is prolonged or passed on (among the lowest and most degraded Koraks) by drinking the renal excretion and thus a spree may be economically kept up for a week.[24] Evidently the muscarin is excreted unchanged. (See Ziemssen, Fungus Poisoning, Vol. 17.) Toleration develops, though death from an orgy is not uncommon. The meat of animals dead of muscarin poisoning has a pronounced

poisonous action if eaten by others (Stellar & Erman). In regard to the use of *Amanita muscaria* as a fly poison, D. R. Sumstine (Penn.) reports that the apparently dead flies revive fully in about two hours. One of our mycologists has seen them recover after two days. Tappeiner[30] states that the fly poison is easily destroyed.

Toxic Principles of Amanitas

Harmsen's "Pilz-toxin" was never confirmed. Ford[22] agrees that *A. muscaria* owes its action to muscarin but in place of the second poison hypothecated by Harmsen it contains also an hemolysin (as in *A. phalloides*) soluble in alcohol and *a constantly-present agglutinin* belonging to the glucosides. Agglutinins are bodies capable of causing groupings, coherence or agglutination of blood corpuscles when brought in contact with them. They act directly on the blood cells. Given subcutaneously the agglutinin of *muscaria* always caused death in typical convulsions. Violent cooking of the plant, deadly without boiling, was shown to destroy both the muscarin and agglutinin. Subsequent studies of other fungi were based upon a search for the actions of the four active agents thus far enumerated. We have seen from the foregoing consideration of two deadly toadstools that *Amanita phalloides* contains two poisons, (1) an hemolysin which is thermolabile and also easily destroyed by the digestive juices and (2) an Amanita-toxin which is the very definite and powerful poison of the species. Now in *Amanita muscaria* we have (1) muscarin, a poison with its characteristic and individual physiological action, (2) hemolysin in small amount and (3) an agglutinin. Agglutinins are not common in plants. Out of ninety-nine examined they were present in four non-poisonous Papillionaceae and in six Daturas. Among 40 fungi they were present in one-quarter, thermolabile in some, in others heat-resistant. They resisted drying of the fungi better than did the hemolysins and were found to last for years in dried *A. muscaria*.[22]

Amanita pantherina, though rare or lacking in America, may be associated with *A. muscaria* since it is said to be used in Japan to produce mushroom drunkenness. Muscarin has been isolated from it as from the Siberian fungus. Delirium, dilated pupils and hallucinations with visions of beautiful red, yellow and brown objects predominate over the gastro-intestinal symptoms. *A. pantherina* is also used as a fly poison. Poisoning from it shows the usual alimentary irritation coming on within a few hours, great excitement,

delirium and convulsive seizures. Ocular symptoms, loss of memory and syncope are frequent. Gillot has collected thirty cases with two deaths and Inoko, in Japan, a series of thirty-two with one fatality. Recovery is usually rapid but occasionally convalescence requires fourteen days. Atkinson's *Amanita cothurnata* may be the American representative of *A. pantherina,* hence both of these should be avoided as esculents. *A. cothurnata* will poison flies. *A. pantherina* extracts were without effect on animals but only a few plants were tested.[41]

There has been in recent years a tendency to explain away too many cases of minor poisoning as due to indigestion, decomposition of the abundant proteid of mushrooms, or to the possible insect-infection of good fungi—and to refer too many of the cases to "probably *phalloides* or *muscaria.*" Now the rich labors of Ford and his co-workers, both in the field and in the laboratory, and the results of Clark, Smith and Kantor have verified certain clinical experiences and shown us that the list of more or less poisonous species must be considerably extended. *Amanita phalloides* and its few congenors still stand quite alone, head and shoulders above all others, for extreme toxicity. They are, most fortunately, not likely to have any rivals for dangerous qualities. They have retained their place easily at the head of the list of noxious species, but the minor and less poisonous list has been somewhat increased. These nearly all belong, in a way, to a *muscaria* group. It will be the problem of pharmacological and biologic chemistry to show why they cause such a variety of clinical disturbances,—by no means explainable by "indigestion,"—and yet resemble the action of muscarin.

THE GENUS LEPIOTA

In contrast to the genus Amanita with its very dangerous species and its few safe edible forms we have in the equally large genus Lepiota a number of highly prized edibles. Amanita requires close discrimination to distinguish its species; Lepiota, for the mycophogist, principally, that he shall not confuse its *L. naucina* with *Amanita phalloides* and that he shall not mistake the black sheep of the section, *Lepiota morgani* or green-spored Lepiota for *Lepiota procera,* "The Parasol." *L. morgani* is an enticing plant and probably the largest Agaric in the world. It is distinctly American. This fine fungus shows very consistent partiality in selecting its victims for it always poisons certain individuals who try to eat it and never distresses others of the same family. It is credited with at

least one death and many serious illnesses. Significant it is that heating destroys the greater part of its toxic properties.

Dr. Blount (Illinois) says[33]: "One day last month the Man of Science of our house came home with a fine specimen of large white mushroom which he took to the library and identified as 'horse mushroom.'" (If you do not care to discriminate between white-spored and purple-brown-spored Agarics, mycophagy is a dangerous field for you!) "So a few were collected and prepared for dinner. The Man of Science ate a small piece raw at 2 p. m. At 5 p. m., feeling well, he tried another piece, raw, as large as the little finger. At 6 p. m. he felt generally ill and ate no supper. In half an hour he began to have profuse, painless watery bowel movements, but blamed a dentist and his drugs for this." Dr. B. took two small portions each as large as a pea about 6 p. m. The after-taste created loathing. Discomfort was immediate, and consisted of a warm heavy sensation, slight pharyngeal spasm and difficulty of swallowing. By 7 p. m. vomiting had begun, became very violent and continued every five to ten minutes. Diarrhea began and lasted all of the next day. Intense burning pain in the stomach alternated with intervals of lassitude and exhaustion.

At 9 p. m. hypodermic medication (strychnia 1/30, atropine 1/100, morph. sulph. 1/4) and cocaine produced relief and slumber came on at 11 p. m. Pulse was weak and rapid; perspiration free. The Man of Science vomited three times and had diarrhea all night. He felt as usual the next day. He ate most and suffered least. The action of the poison suggests muscarin.

V. K. Chestnut[34] records that the president of the Chicago Mycological Society mistook *L. morgani* for *L. procera*. Prof. Miller (Terre Haute) eats *L. morgani* and tells of six families that do so. One or two members of each family are made sick, though two families have eaten it repeatedly without trouble resulting. "The meat is simply delicious." Galveston and Milwaukee record seven cases of illness and V. K. Chestnut adds twenty beside. Detroit might add four. The symptoms are as above described, apparently also from cooked specimens. The fatal case was that of a two-year old child who died in convulsions in seventeen hours after eating of a raw plant. Poisoning has resulted after every variety of cooking and after soaking in salt water. Webster[35] tells of a New England mycophagist who removed to Missouri, identified *L. morgani* as *L. procera* from pictures (!) and paid the penalty within two hours. He draws the moral, "*Eat only what you KNOW!*" McIlvaine[36] (p. 711) reports another case from Wisconsin of violent illness from

raw (?) *L. morgani,* mistaken for *L. procera* and eaten in very small amount, presenting all symptoms above recorded but with the addition of temporary blindness. Warren (Port Huron) records that in a family of five who ate it two girls were made ill. Symptoms came on early the next morning—seven hours after eating—and were "almost as bad as from Gyromitra poisoning as it is known in Port Huron."

THE GENUS TRICHOLOMA

In this genus McIlvaine agrees to label *T. saponaceum* and *T. sulfureum* as inedible on account of taste. I had for years regarded the entire genus as safe, but in August, 1908, we had a group of seven cases of rather violent poisoning from an innocent-appearing Tricholoma. Good specimens were at once sent to Atkinson who described them as a new species which he named *Tricholoma venenatum.* This agaric has not been found again nor further tested. Of the lot eaten many were badly infested by insects when examined two days later. The symptoms came on one hour after supper and consisted of vomiting, sometimes bloody, retching and considerable prostration in three individuals. All recovered. Surprises like this will continue to occur as long as fungi are eaten. It may be years after some varieties of poisoning occur before the etiology is satisfactorily settled: whether due to a new deleterious species; a known inedible variety not recognized by the consumer; a personal physiologic sensitiveness of the individual; decayed fungi of good species or some infested by acrid insects; the rare presence of a minor toxin in some generally-esteemed edible variety; or simple acute indigestion—perhaps due to gluttony. The observer should endeavor to fix positively the responsibility on the one real cause.

THE GENUS CLITOCYBE

Like Lepiota, this large genus has for years been credited with but one deleterious species. Within a few years two others have been added. All three show muscarin symptoms in variety.

Clitocybe illudens, known as the "Jack o' Lantern" because of its phosphorescent glow, or the "Deceiving Clitocybe," is mistaken every year, in Detroit, by our foreign residents for *Armillaria mellea* or for the European Chanterelle. And on such annual fall occasions it holds high carnival and breaks into the newspapers. The attending physician has a busy night or a few busy hours—

and is credited in the daily press with having saved lives in toadstool poisoning. The mycological investigators visit the family and usually find its members up and about their usual occupations. This is the impression one gets of *Clitocybe illudens* from twenty-nine Detroit cases. The remnants of the feast are usually found to be large half-cooked tough masses. McIlvaine reports a saponaceous taste—and the ability to retain the fungus when eaten. It is possible to make it comparatively harmless by heating it in salt water for half-hour, then taking it out and frying it in butter.[39] Farlow[36] reports illness of four persons. They found the fried flavor excellent. Within two hours all had free vomiting lasting all afternoon, no depression, no intestinal disturbance. No emetics were used since the Jack o' Lantern carries this property with it and may thus ward off more serious results. At a New York state institution eight teachers and children, after terrible nausea, recovered. No fatalities have been recorded. Diarrhea and prostration may occur. Clark and Smith[37] found that extracts of the plant would stop a frog's heart which would recover under atropine. Similar results were obtained on the creature when paralyzed by the extract. They conclude that *Clitocybe illudens* exerts a characteristic muscarin effect on exposed hearts which effect is completely overcome by atropin. (Not the case in extracts of *Amanita muscaria.*) Ford finds no hemolysin but the power to produce an acute intoxication in guinea pigs, fatal in one to seven days or a chronic intoxication lasting fifteen days. No lesions postmortem. Rabbits unaffected. After one year of drying boiling for half-hour destroyed the toxicity.

The characteristic American *Clitocybe illudens* has its phosphorescent and related European correspondent in *Agaricus* (or *Pleurotus*) *olearius,* which, mistaken for the Chanterelle, caused illness of the *illudens* type in France.[44]

Fabre writes, "The soft light of *Agaricus olearius* has confounded our ideas of optics; it does not reflect, it does not form an image when passed through a lens, it does not affect ordinary photographic plates." (Fabre, Poet of Science—LeGros.)

Clitocybe dealbata var. *sudorifica* or *Clitocybe sudorifica,* the sudorific Clitocybe, is an interesting little toxic toadstool recently added to the black list. It is often found among "fairy rings" (*Marasmius oreades*). I believe it has been picked with the latter and thus caused trouble, though easily distinguished. The flavor is good. Minneapolis has a record of two cases of poisoning. Peck himself tested it, eating eight caps slightly fried, and got the usual

reaction, i. e., some five hours of profuse perspiration beginning on the forehead and spreading over the body. This may be attended by increased nasal and salivary secretion, hiccough and discomfort, though there are no other ill effects.[42] The original lot was tested on animals.[40, 41] In a rabbit the watery extract produces profuse salivation in a few minutes with weakness and sickness, increased renal activity and activity of the bowels, followed by gradual improvement. Fatal to guinea pig in one quarter hour. Even the boiled extract paralyzed the respiration in seven minutes. Autopsy negative. One rabbit died with slightly contracted pupils. In a third guinea pig there was salivation, lachrymation, etc., increased respiration and then respiratory paralysis. Drops in the eye contracted the pupil for four hours. Its action therefore is that of the muscarin-pilocarpin series. The little Clitocybe seemed more poisonous than *muscaria* extract tested side by side with it for it killed rabbits that withstood larger doses of *muscaria* extract. A frog's heart could be stopped for one hour with it and then revived with atropine. *Clitocybe dealbata* should likewise be avoided for *C. sudorifica* has been mistaken for it by a well-trained mycologist.

Clitocybe morbifera is similar in habitat and appearance to the preceding and is closely related to it.[42] In four cases in Middleville, Michigan, which have come to my attention, the symptoms were more severe and serious than those of *C. sudorifica*. There was more discomfort and the attending physician recognized the likeness of the clinical picture to muscarin disturbance and used atropine. Four people ate, and three were made ill. The one that suffered most had over-taxed her digestive powers the day before—a factor that seems to predispose to mushroom poisoning. Symptoms came on two hours after eating and were abdominal pain, vomiting of food including entire specimens of tough "Fairy Ring" fungi, purging, sweating, cold extremities and collapse. In one case there was some blindness. All were fairly well the next day. Animal tests have not been made. These must henceforth be regarded as a necessary part of the record.

Clitocybe nebularis which made Cordier ill, and is reported as poisonous when raw (Bertillon), is legally allowed among the thirty varieties permitted in the markets of Munich.[11] Here legal enactments, duly enforced, have reduced the number of poisoning cases.

THE GENUS HYGROPHORUS

Experimentally in man no Hygrophorus is known to be inedible and there are many fine esculents. *Hygrophorus conicus* used to be forbidden and Demange has attributed a serious outbreak of poisoning to it. It is fatal to guinea pigs by chronic intoxication—as are many perfectly safe fungi. Cooke and McIlvaine say it is all right. *H. pratensis* var. *cinereus* is toxic to guinea pigs.[22] It is edible. Var. *albus* contained a heat-resistant agglutinin and hemolysin: toxic to guinea pigs. Edible. *H. marginatus* similar and edible. See Bibliography, reference 22, for several others. The genus is either devoid of action or poisonous by chronic intoxication only to guinea pigs. An excellent record, so far. The species are clean, beautiful and inviting.

THE GENUS LACTARIUS

Lactarius contains some well known edible mushrooms—*L. deliciosus, volemus, corrugis,* being well liked. McIlvaine says that not a single species retains its pepperiness after cooking. Some of the genus tasted raw are horrible. *L. torminosus* "the griping milky," is charged with having caused fatal illness.[45] In Germany it is known as the "Birken"—or "Gift-reizker." Eleven were poisoned. Three children ate it fried, the youngest, aged two, died in twenty-four hours. Eight Polish laborers, including two women who ate most, prepared it. The women died after six day's illness, treatment coming late in their case. Symptoms came on in about five hours and consisted of nausea, headache, abdominal cramps, vomiting prolonged and even bloody; diarrhea was synchronous, violent and profuse and accompanied by tenesmus. Anuria and albuminuria followed. Skin dry and later jaundiced; pupils dilated; heart negative but weakening; respiration rapid, shallow, irregular and finally Cheyne-Stokes. Temperature normal. Liver somewhat enlarged. The remainder of the description, as well as the postmortem findings in the adults, suggests very strongly that *A. phalloides* was the cause and not *L. torminosus.* Atropin proved without effect in the therapy and the invaluable hypodermoclysis of normal saline solution was not used. No account of why or how *L. torminosus* was settled upon as the cause is given. Hockauf[11] doubts the diagnosis and says many authors (six are named) say *L. torminosus* is harmless when cooked. Krombolz has eaten it though the taste

was bad. Huseman's two cases referred to the species fit *Amanita muscaria*. Great mycologists give conflicting reports. Kunkel says in Sweden it is used cooked and is poisonous only when raw, and this agrees with Ford's results.[22]—Ford found that its hemolysin and agglutinin were destroyed at 150° F. Though acutely fatal to both guinea pigs and rabbits which showed convulsive-like movements, with retraction of the head—a little like *A. muscaria* intoxication but with more somnolence—these toxic effects were not obtained when the extract was cooked one-half hour. Its safety or danger perhaps depends entirely upon the cooking. Maass[12] alludes to the presence in some fungi of drastically purgative resinous acids which may be decomposed by cooking processes and become foods. The milk of the Lactarii seems to be such a substance. "Insects eat both *L. torminosus* and *L. deliciosus*. They pronounce excellent what we find poisonous and vice versa" (Fabre). Hockauf regards *L. torminosus* and *L. zonarius* as poisonous and *L. plumbeus, L. chrysorrheus, L. vellereus, L. insulsus, L. pubescens, L. pyrogalus, L. fuliginosus* and *L. violescens* as suspicious or inedible. McIlvaine reports *L. insulsus* and *L. vellereus* as edible, as good as *L. deliciosus*. Murrill's list of forbidden mushrooms is headed by *L. rufus* and includes *L. torminosus, L. fuliginosus, L. vellereus, L. pyrogalus* and *L. theiogalus*—perhaps all condemned only on account of their taste when raw. Fabre's household finds *L. deliciosus* overrated, coarse and difficult to digest.

Lactarius uvidus extract was acutely poisonous to guinea pigs, fatal in forty-eight hours, but had no effect on rabbits. No hemolysin or agglutinin. Several authors rank it poisonous; the Boston Mycological Club pronounce it deleterious. With *L. torminosus* and *Clitocybe illudens* it is ranked as a violent gastro-intestinal irritant.

THE GENUS RUSSULA

Russula, one of the most difficult genera for reliable specific distinctions, appeals to the mycophagist because of the attractiveness, tenderness and abundance of its species. Members of the Detroit Mycological Club and the Institute of Science have for years eaten all the bright colored and peppery Russulas indiscriminately and believe that *Russula emetica* is a safe fungus to eat in Michigan. Hockauf says of the European *R. emetica* which is so often condemned, that our knowledge is insufficient and that exceptions can justly be taken to reports in the literature. Krapf

was made ill by it (?) before 1800 and its bad name has followed in all subsequent reports which are based on this almost exclusively. Hockauf would take reports of many bad sorts with reserve. McIlvaine is very emphatic that about all Russulas are good, even *R. emetica,* identified by Peck. *R. foetens* smells ill, tastes worse and made Krombholz slightly ill. In 1817 ten deaths in Bohemia were credited to Russula. Murrill[7] includes *R. emetica* in his poisonous list and credits it with cholin, pilztropin and muscarin and puts down *R. foetens, R. nitida* and *R. fragilis* as mildy poisonous or suspicious. Warren (Port Huron) says, "I have eaten every kind of Russula I have gathered except *R. foetens* and no one would care to eat that. Never any bad effects. Greatest fault is that they are liable to be wormy. *R. vesca, R. virescens, R. cyanoxantha,* and *R. alutacea* are permitted in the Munich markets. The "fraglos giftig" *R. emetica* is eaten in the Baltic province Esthonia after parboiling. (Maass.[12])

Frey[16] says that poisoning by Russula should be classed among the greatest rarities. He reports two fatal cases, studied in the greatest detail and from every angle, with thorough autopsy. The clinical picture was not unlike that of *A. phalloides* intoxication, with gastro-intestinal symptoms dominant. The two boys that died (aged twelve and fourteen) ate the soup which they had prepared, on Sunday evening and Monday morning, were ill Monday night, attended school on Tuesday and became very ill that night, as did the father. They died on Thursday. Postmortem, the liver was not that of *A. phalloides* fatality and the gastro-intestinal hemorrhages and appearances were regarded as characteristic of the irritant action of Russula poison. It is assumed, in these two cases, that an essential change (spoiling) took place in the soup between the first and second meals. An official investigation of the abundant remnants of the fungi ruled out *A. phalloides* and placed the blame on spoiled Russula varieties.

THE GENUS MARASMIUS

Marasmius, the family of the internationally famous "fairy ring mushroom," has long been credited with having the poisonous *M. urens* and the doubtful *peronatus.* McIlvaine would clear both of suspicion. We have no data but we would again warn of the danger of getting *Clitocybe sudorifica* and *Clitocybe morbifera* cooked with *M. oreades.* The latter, moreover, has been found tough, leathery

and entire in the vomited matter after a mushroom feast—illness *ex abusu,* a common form of spurious mushroom poisoning.

Conclusions on White-Spored Genera

Of some 50 families of Agarics about 23 are white-spored. Moreover, more than half of all species one finds belong to this section. Though the most dangerous toadstools belong to the Leucosporae, there are so many fine edibles that we do not wish to discard all the white-spored species. If we are to eat fungi at all we must expect to exercise discriminating observation on every specimen intended for the table. In Amanita, the edible *A. rubescens* is no harder to distinguish from the dangerous Amanitas than are *Lepiota naucina* and many others. Mixed lots of many varieties are a menace and should be used only by the trained student who knows the qualities of each species in the collection. The number of fatalities from fungi gathered by children tells its own story. Cases among students of mycology have all been due to the milder species, and have had the saving grace of adding real discoveries or valuable information to our knowledge. If such cases are duly published a real service and a duty are rendered to science. A synopsis of white-spored species which are definitely deleterious shows: About thirteen white Amanitas and a few nearer *A. muscaria* in their physiological action; one each in Amanitopsis, Lepiota and Tricholoma; three Clitocybes; at least one (and perhaps a half-dozen) in Lactarius; Russula uncertain. Lactarius and Russula are closely related genera, and will require much more investigation, both by eating and by laboratory studies, before the properties of the species will be known. Species closely related botanically are often widely separated toxicologically, and vice versa. This is seen in the contrasting qualities of *Amanita phalloides* versus *A. solitaria* and *A. rubescens; A. muscaria* vs. *A. frostiana* and *A. caesarea; Lepiota morgani* vs. *L. procera; Tricholoma venenatum* vs. *T. terreum* and others; *Clitocybe illudens* vs. *C. multiceps* and others; *Clitocybe dealbata* vs. *C. sudorifica; Lactarius torminosus* vs. *L. vellereus* and others.

The number of genera is small and some mycologists would avoid eating all species of the section. The common favorite *Pluteus cervinus,* or "fawn mushroom," has caused disturbance several times, attended by numbness and tingling in the extremities, mild general discomfort and an urticarial rash. Dr. Whetstone (Minnesota) has a record of the case of poisoning of an Iowa physician, attended by abdominal pain, nausea, and vomiting coming on three hours after eating. Cases like this should make one hesitate to recommend almost any species to the uninitiated.

THE GENUS ENTOLOMA

All species of Entoloma should be avoided by the mycophagist. They are seldom used. Warren says that you cannot cook the raw taste out of them. Vomiting, diarrhea, tenesmus, mental and physical depression are credited to them but no deaths.[22] Six species examined by Ford act identically, producing fatal chronic intoxication in guinea pigs or rabbits—sometimes in both. They vary somewhat in agglutinins and have no hemolysins. (*E. salmoneum, E. strictius, E. cuspidatum, E. nidorosum, E. rhodopolium, E. sinuatum* or *E. fertile.*) *E. grande* is under suspicion.[17] *E. modestum* and *E. subtruncatum* were negative.[41]

E. fertile (sinuatum)—¼ oz. nearly killed W. G. Smith (Stevenson, Vol I). It "harbors a virulent poison." The genus may have its own poison, as Amanita. According to a recent collection of cases by Sartory[46] in France *E. lividum* is an extremely dangerous fungus, causing severe illness, and occasionally death. He believes that *E. lividum* is nearly as poisonous as some forms of *A. phalloides.* Butignot refers four cases of violent illness to it,[52] though but few specimens were in the mixture eaten. Vomiting and abdominal pain, sweating and a vile diarrhea were the result.

These are not usually regarded as poisonous.

THE GENUS PHOLIOTA

"I have nothing but praise for the entire genus." (McIlvaine.)

Recently *P. autumnalis* has arisen to claim high rank as a toxic fungus.[39] In 1911 a mother and two children ate heartily of it. The children died. Severe poisoning of three individuals is also reported from Minnesota. Animal tests by Ford and Sherrick[41] on the Minnesota lot were negative on guinea pigs, rabbits and the frog heart, but a New York lot, although negative on blood corpuscles, was acutely poisonous to guinea pigs and rabbits even after heating. Atropin did not neutralize the dilating effect on the heart. Postmortem appearances resembled those of *A. phalloides* and the extracts were quite as poisonous. It should be grouped with the deadly poisonous Agarics, with the nature of the poison unknown.[25] *P. mutabilis* is approved in Munich.

THE GENUS INOCYBE

Absolutely negligible and uninviting as food, this genus has likewise recently taken an important rank toxicologically from laboratory studies. The trouble began when Dr. Deming (once Vice-President of the New York Mycological Club) knowingly gathered *Inocybe infida* and mixed it, for cooking, with *Panaeolus papilionaceus* which he knew to be non-poisonous. The chance taken was one in a thousand—but he lost. (See 37, 47 and 48 in Bibliography.) Five people were made ill. Symptoms, which came on soon, were a sense of fullness in the head and a rapid pulse—as if nitroglycerin had been taken. Sweating and warmth, no nausea or prostration; slight confusion, pressure and pain in the lower bowel. Some patients vomited, some had diarrhea. Recovery was complete in a few hours under simple treatment. Conclusions[37, 48] are that *I. infida* contains a poison of the type of muscarin, acting more particularly on the nervous system and similar to the nar-

cotic of *Inocybe infelix*. (See below.) Atropin acts as antidote. The relationship of the toxins of *I. infida* and *I. infelix* to those of *A. muscaria* is not yet clear.

Inocybe infelix, one of the most common Inocybes, closely related to the preceding, has not been tested for edibility, nor thus far been reported as toxic to man, but its poison seems definite and powerful. Ford and Sherrick[40] found it to contain a definite poison which resists dessication and boiling. Small doses produced a deep sleep in guinea pigs and rabbits from which they awoke well. A profound acute intoxication and coma, quickly fatal, followed large doses. The intoxication was such as is seen only with *Lactarius torminosus*, a somnolence with retracted head (rabbits), passing off in five hours. The action was not characteristically that of *A. muscaria*, though not inconsistent with muscarin, but that of a narcotic of some sort. Further work is promised. Autopsy on guinea pig showed hemorrhagic spots and perforating gastric ulcer. Generally the examination was negative. *Inocybe decipiens* has likewise no clinical record. Though its agglutinin is destroyed by heat, the heated extract in 2 to 4 cc. doses nevertheless kills guinea pigs acutely—even in 20 minutes—due to dilated heart. Smaller doses bring on lachrymation, salivation and nasal discharge, with labored respirations. These symptoms last a few hours and disappear, but the animals die in a day. Occasionally hemmorhage into the stomach is found postmortem. Dropped into the eye of rabbits, the pupil contracts—resembling *A. muscaria* and muscarin. Boiling the extract does not change its action. This significant record entitles this Inocybe likewise to a place among the more dangerous toadstools.[41, 1]

Inocybe sp. agrees in biologic pharmacology very closely with the preceding and the same conclusions are justified in this newest addition to a bad family. Agglutinin powerful, but thermolabile. A muscarin-pilocarpine poison.[50]

THE GENUS HEBELOMA

Hebeloma is closely related to Inocybe. The generic distinctions may be learned in order that the mycophagist may reject both genera as inedible. They never will be missed, anyway. Little is known about them. *Hebeloma sinapizans* is suspected (eaten with a gay mixture which included l'Amanita jaune citrone).[51] *Hebeloma fastibile* is related to Inocybe.[17] Kobert would class *I.*

rimosa and *H. fastibile* in the muscarin group.[1] Ford[50] reports favorably on *H. crustuliniforme* and another closely related species, even though the former is called "poison pie" in England.

Summary of Brown-Spored Genera

In summarizing the brown-spored group we have to take strong exception to the recent idea that none are known to be poisonous. Pholiota has some edibles worth while but the importance that *P. autumnalis* (perhaps identical with *P. marginata*) has recently achieved as a dangerous species is an unexpected warning on the family. Flammula has fair edibles and is free from suspicion at present. Kauffman's long and careful studies on the glorious genus Cortinarius will now enable us to begin to record the qualities of its species with some hope of accuracy. Past experience on its species warrants the statement that they are pretty safe esculents. The remaining brown-spored families should be rejected.

Hypholoma sublateritium is regarded as poisonous in Europe. It is sometimes bitter, and on this account alone, like many other fungi, has probably been wrongly labeled. Our Club members have occasionally found the "Bricktops" and others inedible, on account of taste. Kobert states that the "Falscher Stockschwamm," *H. fasciculare,* is not edible. Kunkel says it may be poisonous but not very. *H. instratum* and *Psilocybe cernua* both produce acute intoxication in guinea pigs, fatal in three days. Internal and subserous hemorrhages and enlarged glands were found postmortem. (*Morchella esculenta,* the Morel, produces similar findings). Edible properties are not recorded. No fatalities in man have been referred to Hypholoma and there are many edible species.

Agaricus or Psalliota—the meadow mushroom family—contains the most famous and most sought edibles, a number of species. Any one who knows of the woods-inhabiting species in the genus would probably know and avoid the deadly Amanitas growing among them. Though they do occur, it is very rare for the dangerous white Amanitas to get out into the open grassy haunts of *Agaricus campestris* and *Lepiota naucina.* But no one should rely on usual habitat as his safeguard. He should know well the appearances in detail of the plant he may safely use. We know that two of our Michigan fatalities were due to children wandering into the woods and adding *Amanita phalloides* to "the meadows" they had collected, and three other Michigan deaths were caused by mistaking the "Destroying Angel" for *Lepiota naucina.*

Ford, in 1907, stated that no cases of poisoning have ever resulted from the use of any of the purple-spored or black-spored Agarics. I am of the opinion that a good many cases of the milder type have been caused by both Coprinus and Panaeolus. It will come as a shock to the lovers of the old reliable "inkies" to find them candidates for the increasing cohort of poisonous fungi. Their reputation has been as fair as their spores are black. That of the "shaggy mane" has been traced back to Pliny.

In "Good Housekeeping" (October, 1910) Dr. Cleghorn tells of ten people in four families accustomed to using ink caps, being made ill on three different dates by *Coprinus comatus*. The appearance was as of one intoxicated. There was failure of muscular coordination, standing being difficult and walking impossible. Drowsiness, loss of emotional control, bloodshot eyes, enlarged pupils, incoherent or inappropriate speech were the symptoms coming on in a few minutes or hours after eating. There was no prostration and heart and lung action were strong and regular. One patient complained of the apparent bending and swaying of the furniture. One had a temporary complete paralysis of the left arm. Practically no food had been eaten but the ink-caps. Prof. John Dearness[58] suggests *Panaeolus campanulatus* as the cause in these cases but in view of the circumstances reported this hardly seems likely. Detroit cases of unpleasant effects—more than an acute indigestion—have been reported from taking beer with a meal of *C. comatus*. I have also known of four cases in which flushed face, bloodshot eyes and rapid and distressing heart action followed the eating of *C. atramentarius*. In two of these cases no alcoholic beverage had been taken. In the other two, only a very small amount to which the individual was accustomed. Further reports concerning the inkies are desirable.

Ford[22] has examined *Panaeolus retirugis* only. It is regarded as edible by all authorities but is similar to *P. papilionaceus* which though edible, has been known to produce a peculiar intoxication. He found no hemolysin or agglutinin. Fatal to guinea pigs and postmortem negative. *P. campanulatus*, classed as poisonous by Murrill, is eaten by McIlvaine. Its bad reputation goes back to

1816 and has not been taken seriously. A Minneapolis report says that two rather delicate ladies ate of it—two tablespoonsful of stew. Drowsiness came on quickly; a sensation of intoxication, dizziness, staggering, trembling, numbness, contraction of the jaw, stricture of the throat, precordial distress, headache with sensation of fullness, face flushed and eyes injected, no nausea. Delusions of sight accompanied insomnia—the patients saw big red automobiles in the room or queer figures on the wall paper. The eyelids in one case were temporarily paralyzed. Mild but irritant diarrhea. In one case the heart was intermittent for a week. Recovery was not prompt. A third and more vigorous patient only tasted the stew. Two hours later she complained of dizziness, ringing in the ears and dry throat.

P. papilionaceus, "The Butterfly," has flitted into and out of the questionable list. McIlvaine has seen it produce hilarity and other mild symptoms of intoxication, soon over. Moderate quantities have no effect. Murrill does not rank it as certainly bad. It is a small uncommon Agaric and may therefore be easily spared. In nine years experience in cultivating the gardener's mushroom I have not seen the Coprini or Panaeoli coming on the beds in amount sufficient to warrant the picking of them, but know that *P. subbalteatus* has thus occurred.

BOLETUS

Though these volumes deal only with the Agarics, or gilled fungi, a paper on mushroom poisoning would not be satisfactory did it fail to include some matter on the Boleti and on Gyromitra, especially since we have some positive data to report.

Ford[22] says that the definitely poisonous Boleti are not many, and that even the toxic, by reason of their bad taste or emetic or purgative action, protect the user from great harm. But few deaths have been traced to Polypores. Among the important esculents are *B. edulis, B. scaber* and *B. granulatus.* The majority are edible, but bitter and wormy varieties are common, and others produce vomiting and diarrhea. McIlvaine regards the genus as very safe. On the other hand, a gentleman at Walloon Lake, Michigan, after spending some weeks testing Boleti, said he had not found one variety that did not make him sick! Warren (Port Huron) says, "I never eat them and I tell others to let them alone. There are too many good kinds to bother with wormy Boletus." *B. satanus* and *B. luridus* are everywhere called poisonous, though the toxic principle is little known. Kobert found muscarin in the latter, but conservative Michael says it is edible. *B. clintonianus, B. cavipes, B. paluster, B. chrysenteron* var. *sphagnotum* were all found[22] free from muscarin or definite poisonous action on guinea pigs and rabbits. Variety *sphagnorum* has not been reported edible but *B. chrysenteron* and the other three are approved. McIlvaine, after years of testing by many people, is very positive that both *B. satanus* and *B. luridus* are edible. *Boletus felleus* is free from hemolysins and agglutinins and muscarin, but produces chronic intoxication in rabbits and guinea pigs, fatal in two or three weeks. Extract from the dried plant produced a steady emaciation in rabbits and progressive cachexia in guinea pigs. Probably to be classed as poisonous.[40] Very bitter and inedible.

B. chromapes: No hemolysin, agglutinin nor muscarin. Poisonous only to guinea pigs. Decision deferred. Edible (McIlvaine).

B. affinis and *ornatipes:* A thermolabile agglutinin destroyed at 150° F. No definite action. Edible (McIlvaine).

B. bicolor: An agglutinin; negative on hemolysin and muscarin. Non-toxic. One of the very best esculents (McIlvaine).

B. separans: An agglutinin requiring boiling for its destruction, non-toxic. Edible, McIlvaine and Hard.

B. ravanelli seems to be safe but not tested by actual use.

B. roxanae, similar to *B. separans.* Dietic properties unknown.

B. miniato-olivaceus should be regarded with suspicion because of the report on its var. *sensibilis* (below). Ford[40] finds it to contain a heat-resistant agglutinin and to be poisonous to guinea pigs by chronic emaciation. Rabbits were not affected. No evidence of muscarin. (Compare *Clitocybe dealbata* versus *C. sudorifica.*)

B. pachypus has a bitter taste and a bed-bug odor.[11] A case of poisoning which Hockauf would refer to cheese, has been credited to it. Murrill adds *B. ferruginatus, B. eastwoodiae, B. frostii* (edible, Peck), *B. morrissi,* and *B. rubinellus* to the uncertain or suspected. Fabre, in a chapter on insects and mushrooms, (Life of the Fly), records that his peasants eat *B. satanus* and other doubtful species after boiling them in salt water and rinsing.

Boletus miniato-olivaceus var. *sensibilis.* It will be seen from the above that our opinions on some species of *Boletus* are much at variance. The following case illustrates how effectively a student of mycology can add to our knowledge by *following up* thoroughly, *and reporting* cases of poisoning. Collins[59] records that a certain Boletus—found to agree with the erroneously-figured edible *B. subtomentosus* in Palmer's "Mushrooms of America"—was broiled and eaten for breakfast. Three persons ate sparingly and two ate freely. In two hours vomiting and then purging, with collapse calling for brandy and ether subcutaneously in one case, with narrowing or closing of the field of vision, coldness and helplessness, came on. There was no vertigo, headache nor acute pain. The action was mostly that of an irritant. Coffee was the principal stimulant used. One patient did not recover fully for several weeks. Fresh Boletus specimens were soon secured from the original spot and again one year later. These were identified by Peck as *B. miniato-olivaceus* var. *sensibilis.*

GYROMITRA ESCULENTA

This fungus is also known as *Helvella esculenta,* the false Morel, and the Lorchel. Our Michigan species may include *G. brunnea.* Dispute still rages around this fungus and this is characteristic of a species that contains a minor poison or an inconstant one or one that affects only a few individuals and these only

at certain times. *G. esculenta* has a long criminal record in Europe. Nevertheless, it is not everywhere under the ban even there, for its sale, dried or fresh, is permitted in Berlin and Munich though forbidden in Austria. Dried, dusty, wormy (Anobium and Tinea), specimens are sold in the shops; old and inferior fresh ones at reduced prices in the markets. Several American authors say that only old specimens are dangerous. This is not true. The poison is very soluble in hot water and hence parboiling and rinsing may render the mushroom safe. Kobert says that all the Morchellas are safe but that the False Morel furnishes a record of over one hundred and sixty cases of poisoning. Hockauf[60] reports four cases with one fatality (girl of nine years) in April, 1905. Loevegren also has five cases with a fatality, in a girl of five years. Vomiting, colic, weakness, irregular respiration, tonic cramps of voluntary muscles, dilated pupils, jaundice and prolonged unconsciousness were the chief symptoms. Death may occur on the first day or in five days. The active principle has long been known as helvellic acid and has a true blood-dissolving action shown by the hemaglobinuria, icterus, and the pigmentation of the spleen. Nephritis and fatty degeneration of the liver are also found at autopsy. *Gyromitra esculenta* stands alone in producing a true hemolytic set of post-mortem appearances. Frey says that this form of poisoning seems to have become very rare. *Amanita phalloides* does not produce it. Animal tests following Hockauf's cases were negative. Kobert says the fresh extract is very variable. Allen (California) reports *G. esculenta* plentiful there and one of the best edibles, but that it should be let alone. In Michigan it begins to appear on the edge of melting snow banks even as early as mid-March and I have seen a small fall crop in northern Ontario in September. It is common about Port Huron and is eagerly sought and even sold in the markets. Warren and Peck (letters) and Dearness[58] report a number of illnesses and at least one fatality due to Gyromitra. In the cases of Dearness the family were made ill after eating of the warmed-over cooking. Coma and death of one adult came on the fourth day. In the Michigan cases there were two groups of nine people each who ate, with two illnesses in each group. Symptoms came on in about six hours. Very violent vomiting and diarrhea, with much weakness and fear were the chief symptoms. Heart action was good. The acute illness lasted thirty-six hours, inability to take food three days, and recovery required about five days. "No other ill effects except that they don't want any more Gyromi-

tras." The fungi were fresh and prepared as often before—and since. Warren says, "I know they may contain some kind of poison that affects some people at certain times."

Ford[41] has examined specimens of *G. esculenta* from Massachusetts. He found them entirely negative and harmless in every method of testing on guinea pigs, rabbits and the frog's heart.

CONCLUSIONS AND SUMMARY

Because of the growth of popular interest in the study of the mushrooms and toadstools, both as a "fad" and as a scientific pastime, and because of the influx of foreigners accustomed to use fungi for food, the subject of mushroom poisoning is assuming increasing importance in America.

The white Amanita or Death-cup (*Amanita phalloides*) and its few closely related species are responsible for at least nine-tenths of all fatal cases of mushroom poisoning. In illness caused by this fungus the mortality runs very high. Symptoms are six to ten hours in coming on. Suffering is extreme, and death often does not occur until a week or more has elapsed, though the course is quicker in children. There is no antidotal treatment. Clinical course and post-mortem findings are characteristic.

The white Amanita group contains a toxin found in no other fungi. It is a poison which causes profound degenerative changes in the internal organs and in the cells of the central nervous system.

The white Amanitas are easily recognized and avoided.

In all cases of mushroom intoxication, it is the duty of physicians and of friends to make every effort to learn whether or not *Amanita phalloides* has been eaten or whether some less dangerous toadstool is causing the sickness. Such determination is important both in determining treatment and especially prognosis.

The yellow Amanita or "Fly Fungus," *Amanita muscaria,* is second in importance. It is much less poisonous. It produces characteristic symptoms unlike those of *A. phalloides,* coming on in three hours or less, showing prompt disturbance of the nerve centers, and a disease of shorter course and lower mortality. The degenerative changes seen in *A. phalloides* intoxications, do not occur. If fatal results occur, this outcome may be expected early.

A large part of the disturbances produced by *Amanita muscaria* are due to the muscarin constituent of the fungus. This poison

can be counteracted by the drug atropin. Hence *A. muscaria* intoxication is somewhat amenable to treatment.

Physicians should be able to distinguish between these two forms of poisoning. Symptoms are not always definite enough to be relied upon, and specimens of the mushroom which has been eaten should be identified. Local or near-by botanical centers are always glad to be of service in such problems.

A number of minor poisonous species of mushrooms (about twenty) produce symptoms, when eaten, *which resemble the action of muscarin*. These species have not been given the importance and attention which they deserve. They usually also have an emetic action which prevents fatal consequences. Some of them are violent gastro-intestinal irritants and may thus add gravity to the illness. Deaths from them are almost unknown in healthy adults. Determination of the species is of great practical and scientific importance, since these minor cases are more numerous than is generally supposed.

Physicians and students of mycology should report cases in medical or botanical journals. Cases reported in the newspapers should be investigated.

Species closely related botanically may differ very widely in poisonous quality, though this is not usual. No variety should be eaten until its specific name has been determined by competent authority. If its edible qualities are not known or are in dispute, testing should proceed cautiously. The eating of mixed lots is to be condemned unless the user positively knows the reputation of each species to be good. Parboiling is a partial safeguard. None but clean, fresh specimens should be used, and these should be thoroughly cooked and indulged in only in moderation. Most mushrooms are not easily digested. Warmed-over portions are occasionally found to have developed toxic principles.

Good and abundant edible varieties are common, and the lover of fungi need take no chances. He can easily acquire a personal edible list, and can add new species to it as his knowledge and experience grow. Scientific mycology should precede mycophagy and increase one's pleasure in eating fungi.

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(F) MONOGRAPHS, ETC., ARRANGED BY GENERA

AGARICUS. (See Psalliota).

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ECCILIA. See: Saccardo, Fries, Ricken, Moffatt, Peck's Reports, Atkinson (Preliminary Notes on Some New Species: Jour. Mycol., Vol. 8, p. 113, 1902), etc.
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TUBARIA. See: Saccardo, Fries, Stevenson, etc.

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AUTHORITIES AND ABBREVIATIONS

The binomial botanical name of each plant is followed by an abbreviation, e. g. Fr., which refers to the person who named the species. According to the rule established by the International Congress at Brussels in 1910, no names are to be considered valid in the case of the Agarics, earlier than those published in the Systema Mycologica of Fries, 1821-1832. In case the name was used for the same species by someone before Fries, reference may be made to it thus: Fr. (ex. Pers.).

AUTHORS OF AGARICS

A. & S.....Albertini and Schweinitz.
Atk.....Atkinson, Geo. F. (U. S.).
B. & C.....Berkeley and Curtis.
B. & Br.....Berkeley and Broome.
Bann.....Banning, Mary E. (U. S.).
Barla.....Barla, J. B. (France).
Batsch.....Batsch, Augustus (German).
Beards.....*Beardslee, H. C. (U. S.).
Berk.....Berkeley, Rev. J. M. (England).
Bolt.....Bolton, James (Canada).
Boud.....*Boudier, E. (France).
Bosc.....Bosc, Louis (U. S.).
Bres.....*Bresadola, Abbe J. (Austria).
Britz.....*Britzelmayr, Max (Germany).
Bull.....Bulliard, Pierre (France).
Burl.....*Burlingham, Gertrude S. (U. S.).
Cke.....Cooke, M. C. (England).
Clem.....*Clements, F. C. (U. S.).
Curt.....Curtis, Rev. M. A. (U. S.).
D. C.....DeCandolle, Augustin P. (Switzerland).
E. & E.....Ellis and Everhart.
Earle.....*Earle, F. S. (U. S.).
Ell.....Ellis, J. B. (U. S.).
Fr.....Fries, Elias Magnus (Sweden).
Frost.....Frost, Charles C. (U. S.).
Gill.....Gillet, C. C. (France).
Henn.....Hennings, Paul (Germany).
Herbst.....Herbst, Wm. (U. S.).
Kalchb.....Kalchbreuner, Karoly (Hungary).
Karst.....*Karsten, P. A. (Finland).
Kauff.....*Kauffman, C. H. (U. S.).
Kromb.....Krombholz (Germany).
L. or Linn.....Linneaus, Carl von (Sweden).
Lev.....Leveille, Joseph H. (France).
Lindb.....Lindblad, M. A. (Sweden).
Lloyd.....*Lloyd, C. G. (U. S.).
Longyear.....*Longyear, B. O. (U. S.).
Maire..... *Maire, René (France).

Mass.....Massee, Geo. (England).
Mont.....Montagne, Camille (France).
Morg.....Morgan, A. P. (U. S.).
Murr.....*Murrill, Wm. E. (U. S.).
Pat.....*Patouillard, N. (France).
Pers.....Persoon, Christian Hendrick (Europe).
Pk.....Peck, Charles Horton (U. S.).
Q. & S.....Quelet and Schulzer.
Quel.....Quelet, L. (France).
Rav.....Ravenel, W. H. (U. S.).
Ricken.....*Ricken, Rev. Adelbert (Germany).
Rom.....*Romell, Lars (Sweden).
Roze.....Roze, Ernest (France).
Sacc.....*Saccardo, P. A. (Italy).
Schaeff.....Schaeffer, Jacobi C. (Germany).
Schroet.....Schroeter, Julius (Germany).
Schw.....Schweinitz, Rev. Louis David de (U. S.).
Schulz.....Schulzer, von Muggenberg (Europe).
Scop.....Scopoli, Giovanni A. (Italy).
Sec.....Secretan (Switzerland).
Smith.....Smith, W. G. (England).
Sow.....Sowerby, James (England).
Vahl.....Vahl, Martin (Norway).
Vitt.....Vittadini, Carlo (Italy).

Those names which are starred are living mycologists.

MISCELLANEOUS ABBREVIATIONS

Acad..... Academy.
Bot..... Botanical.
Bull.....Bulletin; a publication.
Cab..... Cabinet.
Cm..... Centimetre.
Fig.....Figure, referring to an illustration.
Gaz..... Gazette.
Hist..... History.
Jour..... Journal.
Mem.....Memoir, a publication.
Micr.....Micron, one thousandth of a millimeter.
Mm..... Millimetre.
Mus..... Museum.
Myc.....Mycology, Mycological.
Nat.....Natural, Nature.
No.....Number of a figure or plate.
Op..... Opposite (page).
p..... Page.
Pl.....Plate; referring to illustration.
Rep.....Report; a publication.
Ridg.....Ridgway's Color Standards, 1912.
Sci..... Science.
Soc..... Society.
Sp. nov..New Species; described for first time by the writer.
Var..... Variety.

GLOSSARY

ABERRANT, differing from a certain species, genus, etc, in some respects, but not easily placed in another species, genus, etc.

ABNORMAL, (of a specimen), not properly developed.

ABORTIVE, (of a fruit-body or its parts), not perfect or entirely lacking.

ABRUPT, (of a stem), terminating suddenly.

ABRUPTLY-BULBOUS, (of the bulb of a stem), not rounded above.

ACICULAR, (of a stem or cystidia), bristle-shaped, very slender.

ACICULATE, same as acicular.

ACRID, (of the taste of a mushroom or its juices), biting on the tongue.

ACUMINATE, (of cystidia, or the ends of a lamella), gradually narrowed to a point.

ACUTE, (of cystidia or the edge of the gills), pointed; less than a right-angle; sharp-edged; not prolonged.

ADNATE, (of gills), see Fig. 1, 2; also (of the pellicle, scales, etc.), not capable of being peeled off or easily detached.

ADNEXED, (of gills), see Fig. 1, 4, narrowly attached to the stem.

AFFINITY, (of a species, genus, etc.), closely related by natural characters.

AERUGINOSE, (color), verdigris-green.

AERUGINOUS, same as aeruginose.

AGGLUTINATE, (of fibrils, hairs, etc.), as if glued together in tufts.

AGGREGATE, crowded close together.

ALLANTOID, (of spores), sausage-shaped.

ALLIACEOUS, (odor), like onions or garlic.

ALUTACEOUS, (color), light leather colored; isabelline; pale tan.

ALVEOLATE, (of the surface of pileus or stem), deeply pitted.

AMBIGUOUS, (of a species, genus, etc.), doubtful as to its place in classification.

AMYGDALINE, (odor or taste), like that of peach or cherry stones, cherry-bark, etc.

ANALOGOUS, similar in form, structure or appearance, but not necessarily related to.

ANASTOMOSING, (of gills, ridges, wrinkles, etc.), connecting crosswise, so as to form angular areas or pits bounded by the connecting gills, etc.

ANGULAR, (of spores), not regular in outline, not rounded; (of scales or pileus), when formed by cracking of cuticle, etc.

ANNULATE, (of stem), bearing an annulus.

ANNULAR, (of remains of veil on stem), resembling a ring.

ANNULUS, the encircling band or curtain on the stem, resulting from the loosening of the inner veil from the margin of the pileus. See Fig. 2, 5.

ANOMALOUS, deviating from the general rule.

ANTERIOR, (of gills), the end of the gills at the margin of the pileus; in front.

APICAL, (of stem), the portion near the pileus; referring to the apex.

APICULUS, (of spores), the short, often sharp papilla at one end of a spore, by which it was attached to the sterigma.

APICULATE, provided with an apiculus.

APPENDICULATE, (of margin of pileus), hung with fragments of the veil.

APPLANATE, (of pileus), flattened out or horizontally expanded.

APPRESSED, (of scales, fibrils, hairs, etc.), closely flattened down; same as adpressed.

APPROXIMATE, (of gills), free from but approaching the stem; closely; not remote.

ARACHNOID, (of the partial veil), cobweb-like.

ARCUATE, (of gills or margin of pileus), curved like a bow.

ARCUATE-DECURRENT, (of gills), extending down the stem.

AREOLATE, (of surface of pileus or stem), arranged in little areas.

ARGILLACEOUS, (color), clay color, resembling ochraceous-cinamon-brown.

ARID, (of gills), dry, somewhat parchment-like.

AROMATIC, (odor), of an agreeable aroma, reminding of drugs.

ASCENDING, (of gills), in the case of a conical-shaped or unexpanded pileus.

ASTRINGENT, (taste), causing more or less contraction or "pucker" of mouth membranes.

ATOMATE, (surface of pileus or stem), covered with minute, shining, point-like particles.

ATTENUATE, (of stem), gradually narrowed and thinner.

AURANTIACOUS, (color), of an orange color.

AUREOUS, (color), golden-yellow, reddish-yellow.

AXIS, (of stem), the central, interior portion.

AZONATE, (of surface of pileus), not zoned.

BASAL, (of stem), at the lower end.

BASIDIOMYCETES, see page 26.
BASIDIUM, (of gills), one of the large cells which collectively compose the hymenium and which bear each four spores.
BEADED, (of gills), applied to the row of drops exuding from the edge of gills.
BEHIND, (of gills), toward the stem.
BI—, of two, or twice.
BIBULOUS, (of surface of pileus), capable of absorbing moisture.
BIFURCATE, (of gills), forking by two's.
BISTRE, (color), blackish-brown.
BIOLOGY, the science of living organisms.
BIOLOGICAL, concerning the life of plants or animals.
BLOOM, (of pileus or stem), a minutely velvety surface.
BROAD, (of gills), a relative term, opposed to narrow; determined by experience.
BUFF, (color), pale creamy-gray.
BULBOUS, (of stem), enlarged at base. (See also "abruptly-bulbous", clavate-bulbous and round-bulbous.)
BULBILLATE, (of stem), provided with a small or obscure bulb.
BULLATE, (of pileus), with a rounded knob.
BYSSOID, (of mycelium), the condition when fine filaments spread from the base of the stem or fruit-body over the substratum.
CAESIOUS, (color), pale bluish-gray.
CAESPITOSE, aggregated in tufts but not grown together.
CAMPANULATE, (of pileus), bell-shaped or similar.
CANALICULATE, (of stem), furrowed or fluted.
CANDIDOUS, (color), shining-white.
CANESCENT, (surface), covered with hoary down.
CAP, the pileus.
CAPILLARY, (of stem), hair-like.
CAPITATE, (of cystidia), with a minute knob at the tapering apex.
CARBONACEOUS, (of tissue), of the texture of charcoal.
CARINATE, (of spores), furnished with a keel, boat-shaped.
CARNEOUS, (of trama), fleshy.
CARTILAGINOUS, (of stem, cortex or cuticle), tough-brittle, breaking with a snap.
CAULICOLOUS, growing on herbaceous stems.
CELL, (of fungi), the living, protoplasmic units into which the mycelium and hyphae are divided.
CERACEOUS, waxy.
CEREBROSE, (of surface of pileus), convoluted like a brain.
CHLAMYDOSPORES, (see secondary spores), thick-walled spores developed from hyphae but not on basidia.

CINEREOUS, (color), ashy-gray.
CINNABAR, (color), vermillion, red.
CINNAMON, (color), cinnamon-brown.
CIRCUMSCISSILE, (of volva). See page 593.
CITRINE, lemon-yellow.
CLAVATE, (of stem), thickened toward base, like a club; (of basidia and cystidia), thickened at apex, club-shaped.
CLAVATE-BULBOUS, (of stem), with a bulb which tapers gradually upwards.
CLAY-COLOR, argillaceous.
CLOSE, (of gills), halfway between crowded and subdistant; a relative term.
COBWEBBY, (of veil), composed of threads fine as those of a cobweb.
COCHLEATE, (of pileus), twisted like a shell.
COERULEOUS, (color), sky-blue.
COHERENT, (of stems), grown together.
COMPRESSED, (of stem), flattened lengthwise.
CONCAVE, (of pileus), round-depressed like a bowl.
CONCENTRIC, (of zonation, etc.), rings or zones within one another in a series.
CONCHATE, (of pileus), resembling an oyster shell in shape.
CONCOLOR, (of gills and stem), when of the same color as the pileus.
CONCOLOROUS, same as concolor.
CONFLUENT, (of flesh of stem), continuous with trama of pileus and of similar texture.
CONGLOBATE, (of base of stems), collected into a fleshy mass.
CONIDIUM, (see secondary spores), thin-walled spores developed on mycelium or on the hyphae of the fruit-body.
CONIDIA, plural of conidium.
CONIDIAL, relating to conidia.
CONIDIOPHORE, the specialized hypha bearing a conidium.
CONIFER, mostly evergreen trees bearing cones.
CONIFEROUS, said of forests or wood of conifer trees.
CONNATE, (of stems), grown together.
CONNIVENT, (of margin of pileus), converging on the stem.
CONSISTENCY, the firmness, density or solidity of the tissues which compose the parts of the fruit-body.
CONTEXT, the trama.
CONTINUOUS, (of stem), same as confluent.
CONVEX, (of pileus), regularly rounded, broadly obtuse, etc.

CONVEXO-PLANE, (of pileus), changing from convex when younger to flat when expanded.
CONVEX-EXPANDED, (of pileus), changing from convex and tending towards plane; the margin often remaining decurved.
CONVERGENT, (of trama of gills), in section the hyphae are seen to turn inwards to a median line.
CONVOLUTE, same as cerebrose.
CORIACEOUS, of a leathery texture.
CORNEOUS, of a horny texture.
CORRUGATE, (surface), coarsely wrinkled.
CORTEX, (of stem), the outer, denser rind.
CORTICAL, referring to the cortex.
CORTICATE, possessing a cortex.
CORTINA, the inner or partial veil in some genera of Agarics, the structure of which is cobwebby.
CORTINATE, provided with a cortina, or (of stem) covered by the threads of the cortina.
COSTATE, (of gills, etc.), veined or ribbed.
COTTONY, (of surface), covered by a soft cotton-like substance.
CRENATE, (of edge of gills or margin of pileus), scalloped.
CRENULATE, very finely crenate.
CRETACEOUS, (of color or consistency), like chalk.
CRISPED, (of gills), finely wavy.
CROWDED, (of gills), almost touching one another.
CRUCIATE, (of spores), having the general form of a cross.
CRYPTOGAMS, the group of plants which reproduce by spores and which include the fungi.
CRYPTOGAMIC, relating to cryptogams.
CUCULLATE, (of pileus), shape of a "high hat."
CUNEATE, (of pileus), wedge-shape.
CUSPIDATE, (of pileus or cystidia), tipped with a prominent sharp protuberance.
CUTICLE, (of pileus or stem), a differentiated thin layer of hyphae on the surface; same as pellicle.
CYATHIFORM, (of pileus), cup-shaped or bowl-shaped, flaring above.
CYLINDRICAL, (of stem or spores), of the same diameter throughout its length.
CYSTIDIUM, (of hymenium of gills), mixed with the basidia and usually projecting beyond them; large sterile cells.
CYSTIDIA, plural of cystidium.
DECORTICATED, of dead wood destitute of the bark.

DECUMBENT, (of stem), with the lower end lying against the substratum.

DECURRENT, (of gills), descending on the stem, see Fig. 1, (3).

DECURVED, (of margin of pileus), bent down.

DEBRIS, the mixture of fallen leaves, twigs, wood, etc., covering a forest floor.

DEFLEXED, same as decurved.

DELIQUESCENT, (of gills), absorbing water and dissolving at maturity.

DENTATE, (of gills), toothed on the edge.

DENTICULATE, (of gills), finely dentate.

DENUDED, (of pileus and stem), naked or glabrous by removal of the scales, flocci, etc.

DEPAUPERATE, undeveloped because of lack of favorable conditions.

DEPRESSED, (of pileus), central portion lower than margin.

DETERMINATE, having a fixed, definite limit.

DETERMINATION, assigning a plant to its correct place in the classification.

DIAGNOSIS, a distinctive description of a plant.

DIAPHANOUS, transparent or nearly so.

DICHOTOMOUS, (of gills), repeatedly forking in pairs.

DIFFERENTIATED, applied to portions or tissues of different character, all derived from a homogeneous tissue.

DIFFORMED, irregular in form.

DILATED, (of stem), enlarged.

DILUTE, (of color), reduced in strength.

DIMIDIATE, (of pileus), semicircular in outline, (of gills), that reach only half-way to stem.

DISK, (of pileus), the central portion of the surface.

DISCOID, (of pileus), with a noticeably marked, flattened disk.

DISCRETE, (of veil, scales, etc.), separate, not grown fast to and continuous with the surface.

DISTANT, (of gills), set far apart, especially toward the margin of the pileus; a relative term.

DIVERGENT, (of trama of gills), in section, the hyphae are seen to turn outwards from a median line.

DORSAL, (of pileus), the upper, back side.

DOWNY, (of pileus and stem), composed of fine hairiness.

DRY, not viscid nor hygrophanous.

EBENEOUS, (color), black as ebony.

EBURNEOUS, (color), white like ivory.

ECCENTRIC, (of stem), not attached in the center.
ECHINATE, (of scales, etc.), sharply pointed spines.
ECHINULATE, (of spores, etc.), with minute and finely pointed spines.
ELEVATED, (of pileus), raised up at the margin.
ELLIPTICAL, (of spores, young pileus, gills, etc.), longer than broad, usually more than twice as long as broad and curved in outline.
ELLIPTIC, ELLIPSOID and ELLIPSOIDAL, similar to elliptical.
EMARGINATE, (of gills), notched near the stem. See Fig. 1, (6).
ENTIRE, (of gills), edge not toothed, etc.
EPIDERMIS, see cuticle.
EPISPORE, the outer wall of a spore.
EPIPHYTAL, growing on leaves.
EQUAL, (of stem), of uniform diameter; (of gills), alike in length.
ERODED, (of gills), edge as if gnawed.
EROSE, same as eroded.
ESCULENT, edible, can be eaten.
EVANESCENT, (of veil, annulus, scales, etc), but slightly developed and soon disappearing.
EVEN, (of surface of pileus, stem, spores), without striations, elevations, depressions or unevenesses of any kind. Compare glabrous and smooth.
EXCENTRIC, see eccentric.
EXOTIC, foreign, not native.
EXPANDED, (of pileus), the opening out of the cap while maturing or ageing.
EXSICATTI, dried specimens kept in herbaria, often in sets.
"FAIRY RINGS," mushrooms appearing in circles. See page 4.
FAMILY, a term in classification, each family includes related genera; the scientific ending of a family name is *aceae*.
FALCATE, (of spores), sickle-shaped.
FARINACEOUS, (odor and taste), like fresh meal; (of pileus and stem), covered by mealy particles.
FARINOSE, like farinaceous.
FASCIATED, (of stems, pilei, etc.), grown together so that tissues are intimately continuous.
FASCICULATE, (of fibrils, scales, stems, etc.), crowded in bundles.
FERRUGINOUS, (color), rusty-red.
FIBRILLOSE, (of surface of cap and stem), provided with fibrils or clusters of small fibres composed of hyphae.
FIBROUS, (of flesh of stem), composed of toughish, string-like tissue.

FILAMENT, a thread, applied to the separate threads of the mycelium.

FILAMENTOUS, composed of filaments.

FILIFORM, (of stem), slender as a thread.

FIMBRIATE, (of gills), with the edge minutely fringed, due to presence of cystidia or sterile cells.

FISTULOSE, (of stem), tubular.

FLABELLIFORM, (of pileus), fan-shaped.

FLACCID, flabby; soft and limber; without firmness or elasticity.

FLARING, (of volva or annulus), spreading away from stem at upper margin.

FLAVESCENT, (color), becoming yellowish.

FLAVUS, (color), of Saccardo's Color Key; a light cadmium-yellow.

FLESH, the trama of the mushroom, especially of the pileus and gills.

FLESHY, of rather soft consistency, putrescent; as opposed to leathery, corky, woody, membranous, etc., referring to the consistency of the trama of most of the Agarics.

FLEXUOUS, (of stem), bent in an undulate manner.

FLOCCI, (of pileus or stem), small points or tufts resembling cotton.

FLOCCOSE, (of pileus or stem), provided with cottony substance on the surface.

FLOCCULOSE, finely floccose.

FLOCCULOSE-CRENULATE, (of gills), edge with minute flocculose decoration.

FOETID, (odor), ill-smelling, nauseating.

FRIABLE, easily crumbled or breaking into powder.

FREE, (of gills), not attached to the stem at any time.

FRONDOSE, said of a forest or the wood of broad-leaved trees.

FRONT, (of gills), the end toward the margin of the pileus; anterior.

FRUIT-BODY, the term applied to the mushroom as opposed to the mycelium.

FRUCTIFICATION, the fruit-body.

FUGACIOUS, disappearing early or quickly or (of color) fading soon.

FULIGINOUS, (color), smoky, sooty.

FULVESCENT, (color), becoming fulvous.

FULVOUS, (color), of Saccardo's Color Key; reddish-cinnamon-brown.

FUNGUS, applied to the individuals of a group of plants which lack the green chlorophyll and hence subsist on other plants,

plant-remains or animals: they vegetate in the form of mycelium, and their fruit-bodies are also composed of mycelioid tissue.

FUNGI, the plural of fungus.

FURCATE, (of gills), forked.

FURFURACEOUS, (of pileus or stem), covered with bran-like particles; scurfy.

FUSCESENT, (color), becoming fuscous.

FUSCOUS, (color), a smoky drab; see Ridgway's Color Standards (1912). The term has been used in this report in a wider sense, including paler shades with more brown in them.

FUSIFORM, (of stem and spores), spindle-shaped.

GELATINOUS, jelly-like, applied to tissue whose hyphae become partially dissolved and glutinous in wet weather and when mounted in water under the microscope appear more transparent and wider, loosening from one another.

GENERIC, of the rank of a genus.

GENUS, a term in classification; each genus includes certain related species; the two names, viz. of its genus and its species, compose the binomial by which a plant is known in science, e. g. *Psalliota campestris*.

GIBBOUS, (of pileus), with an unsymmetrical convexity or umbo, or with convexity on one side.

GILLS, the knife-blade-like structures on the underside of the pileus; lamellae; collectively, the hymenophore.

GILL-TRAMA, the tissue of a gill between the two hymenial layers.

GILVOUS, (color), yellowish leather colored.

GLABRESCENT, becoming glabrous.

GLABROUS, (of pileus and stem), surface destitute of scales, hairs, etc., smooth.

GLANDULAR, with sticky drops or glands.

GLAUCOUS, (of pileus), covered with fine white bloom, easily rubbed off.

GLOBOSE, spherical or almost so.

GLUTEN, (of cuticle of pileus or stem, of universal veil), the dissolved gelatinous hyphae of certain tissues; very sticky and toughish.

GLUTINOUS, provided with gluten.

GRANULAR, (of pileus or stem), covered with granule-like substance.

GRANULOSE, same as granular.

GREGARIOUS, growing in company, scattered closely over a small area.

GROUP, a general term, applied indefinitely to a large or small number of plants whether classified or not.

GUTTATE, (of pileus), spotted as if by drops of liquid.

GUTTULATE, (of spores), containing an oily globule.

HABIT, the manner of growth of a plant.

HABITAT, the natural place of growth of a plant.

HAIRY, (of pileus), covered by an arrangement of fibrils resembling hairs.

HERBACEOUS, said of those flowering plants which perish annually down to the roots.

HERBARIUM, a collection of dried plants arranged systematically.

HETEROGENEOUS, applied to a structure composed of unlike tissues.

HIRSUTE, (of pileus), covered with rather long stiff fibres or hairs.

HISPID, (of pileus), covered with stiff bristle-like hairs.

HOARY, (of pileus or stem), covered with dense silky down; canescent.

HOMOGENEOUS, applied to structures composed of uniform tissues.

HOST, the plant or animal on or in which a parasitic fungus exists.

HUE, (of color), used here indiscriminately for "tint" or "shade." See Ridgway's Color Standards (1912) page 17, for correct usage.

HUMUS, the mixture of decayed vegetation and soil in the forest.

HYALINE, (of spores, gluten, etc.), colorless; transparent.

HYGROPHANOUS, (of flesh of mushrooms, or surface of pileus), watery in appearance, like the "water-core" of an apple, moisture disappearing rapidly accompanied by change in color, usually by fading.

HYGROSCOPIC, readily absorbing moisture from the atmosphere.

HYMENIUM, aggregation of the basidia in a continuous layer mixed with cystidia or sterile cells when present; the spore-bearing layer.

HYMENOMYCETES, the group of fungi possessing a hymenium composed of basidia which are exposed.

HYMENOPHORE, the portion of the fruit-body bearing the hymenium.

HYPHAE, plural of hypha; same as mycelium, composing also the fruit-body.

ICONES, colored plates illustrating fungi.

IDENTIFICATION, the study of the characters of a plant in order to determine its name.

IMBRICATE, (of pilei), overlapping one another, like the shingles of a roof.

INCARNATE, (color), flesh-colored.
INCISED, (of margin of pileus), as if cut into.
INCOMPLETE, (of annulus), forming a partial ring.
INCRASSATE, (of stem), thickened.
INCURVED, (of margin of pileus), same as inflexed.
INDIGENOUS, native, not foreign.
INFERIOR, (of annulus), below the middle of the stem.
INFLATED, (of cystidia), swollen like a bladder.
INFUNDIBULIFORM, (of pileus), funnel-shaped.
INNATE, (of scales, fibrils, etc.), a part of the surface tissue, not superficial.
INSERTED, (of base of stem), attached directly without "roots" or fibrils; instititious.
INSTITITIOUS, same as inserted.
INTERSPACES, (of gills), spaces between the attachment of the gills to the pileus.
INTERVENOSE, (of gills), veined in the interspaces.
INTERWOVEN, (of trama), intermingled arrangement of hyphae, not parallel, convergent nor divergent.
INTRODUCED, brought from another country and growing spontaneously.
INVOLUTE, (of margin of pileus), rolled in, especially when young.
ISABELLINE, same as alutaceous; pale tan-color.
LABYRINTHIFORM, of sinuous lines; like a labyrinth.
LACERATE, (of annulus, scales, pileus, etc.), as if torn.
LACINIATE, (of margin of annulus or pileus), cut coarser than fimbriate; slashed.
LACTIFEROUS, (of hyphae of trama), bearing a milky juice.
LACUNOSE, (of pileus or stem), covered with pits or indentations.
LAMELLAE, plural of lamella; same as gills.
LANATE, same as woolly.
LANCEOLATE, (of spores, cystidia or gills), lance shaped; many times longer than broad, and tapering.
LATEX, a juice, usually of milky color, but also applied to other colors.
LATERAL, (of stem), attached to one side of the pileus.
LENS, a hand magnifying glass.
LIGNATILE, growing on wood.
LIGNICOLOUS, same as lignatile.
LINGULATE, (of pileus), tongue-shaped.
LIVID, (color), like that of a bruise; bluish-black.
LOBED, (of pileus), with rather large, rounded divisions on the margin.

LUCID, clear to the understanding; transparent.
LURID, (color), smoky-reddish, sordid.
LUTEOUS, (color), dull egg-yellow; see Saccardo's Color Key.
LUTESCENT, (color), becoming luteous.
MACROSCOPIC, visible without magnification.
MACULATE, spotted.
MAMMIFORM, (of umbo), breast-shaped.
MARGINATE, (of pileus), with a distinctly marked border; (of bulb), with a circular ridge on the exterior upper angle where the universal veil was attached.
MARGINATE-DEPRESSED, (of bulb), provided with a narrow, circular, horizontal platform on the upper side.
MAST, the fruit of forest trees like acorns and nuts, often used of a heap of nuts.
MATRIX, the substance on or in which a fungus grows.
MILKY, of the color of milk.
MEDIAL, (of annulus), situated at or near the middle of the stem.
MEMBRANOUS, (of pileus, annulus, etc.), thin and pliant like a membrane; applied when the trama of pileus is quite thin.
MEMBRANACEOUS, same as membranous.
MICACEOUS, (of pileus), covered with glistening mica-like particles.
MIXED, referring to forests containing both conifer and broad-leaved trees.
MILD, (odor and taste), not with a distinctly marked peculiarity.
MICROSCOPIC, of a size requiring the use of a microscope to see clearly.
MICROSCOPICAL, same as microscopic.
MICRON, (measure), of the length of one-thousandth part of a millimetre; used to designate size as measured by the use of a microscope.
MICROMETER, a disc of glass ruled with lines forming a metric scale for measuring objects under the microscope in microns.
MICRO-CHEMICAL, referring to tests with chemicals on microscopic objects.
MOLDS or MOULDS, certain fungi whose vegetative growth appears mouldy.
MONSTROSITY, applied to a specimen of a very abnormal appearance.
MORPHOLOGICAL, pertaining to form and structure, often used in a phylogenetic sense.
MOVABLE, (annulus), that can be moved more or less easily up and down the stem.

MUCILAGINOUS, slimy.
MUCCOUS, slime.
MUSHROOM, a general term applied to the fleshy Agarics and fleshy species of other fungi; a mushroom may be edible, poisonous, unpalatable, tough, etc., but popular usage applies the term only to edible ones. See toadstool.
MYC., MYCET., MYCETO., MYCO., prefixes signifying fungus.
MYCELIUM, came as hyphae; the vegetative part of a fungus consisting of microscopic threads usually with cross-walls to form the cells which contain the living protoplasm.
MYCELEOID, (of base of stem), provided with a white mouldy growth of mycelium.
MYCOLOGICAL, relating to mycology.
MYCOLOGY, the term applied to the science dealing with fungi.
MYCOPHAGIST, one who eats mushrooms; an epicure concerning mushrooms.
MYCOLOGIST, one who is versed in mycology; a specialist in the study of fungi.
MYCORHIZA, the stunted rootlets of trees, when such rootlets are covered or permeated by the mycelium of fungi.
NAKED, (of pileus or stem), entirely devoid of fibrils, scales or other covering.
NARROW, (of gills), a relative term, the opposite of broad; determined by experience.
NIGRESCENT, (color), turning blackish.
NUCLEATE, (of spores), containing microscopically visible, oil-like globules.
OBCLAVATE, (of cystidia, spores, stem), a reversal of clavate.
OBCONIC, reversal of conic.
OBLONG, (of spores), twice as long as wide.
OBOVATE, (of spores, etc.), reversal of ovate.
OBSOLETE, (of annulus, scales, etc.), very imperfectly developed, hardly perceptible; (of terms), no longer in use.
OBTUSE, (of pileus, cystidia, spores), rounded or blunt; greater than a right angle.
OCHRACEOUS, (color), dingy ochre-yellowish.
OCHREATE, (of volva), sheathing the stem at base like a stocking.
OLIVACEOUS, (color), with an olive shade.
OPAQUE, dull, not shining.
ORBICULAR, (of pileus), circular in outline.
OVAL, (of young pileus, spores), having the shape of an egg.
OVATE, similar to oval but rather pointed at the narrower end.
OVOID, same as oval.

PALLID, (color), of an indefinite pale or whitish appearance.

PAPILLA, a small, nipple-shaped elevation.

PAPILLATE, (of pileus or spores), provided on surface with papillae.

PARALLEL, (of trama of gills), in section the hyphae lie continuously side by side.

PARASITE, an organism living upon another live organism and deriving food from it, with or without fatal effect.

PARTIAL VEIL, the inner veil, extending from the margin of the pileus to the stem. See page 4.

PATCHES, (of scales or remnants of the universal veil), flat, closely applied pieces.

PECTINATE, (of margin of pileus), resembling the teeth of a comb.

PEDICEL, (of cystidia) a slender stalk.

PELLICLE, same as cuticle, sometimes thought of as thinner and more definite.

PELLICULOSE, provided with a pellicle.

PELLUCID, translucent.

PELLUCID-STRIATE, (of pileus), when as the result of the thinness of the pileus the gills become visible thru it and appear as striae.

PENTAGONAL, (of spores), angular and five-sided.

PERIPHERY, the outer boundary or surface.

PERONATE, (of stem), booted; sheathed by the volva or universal veil.

PERONATE-SCALY, (of stem), when the sheath of a peronate stem is broken up and the parts persist.

PERSISTENT, retaining its place, shape or structure, not disappearing.

PETALOID, (of pileus), shaped like the petal of a flower, narrowed somewhat at base.

PHYLOGENETIC, pertaining to phylogeny.

PHYLOGENY, the history of the evolution of the group or race to which a species belongs.

PILEATE, possessing a pileus.

PILEI, the plural of pileus.

PILEUS, the cap or that structure of an Agaric which bears the gills on its under side.

PILOSE, (of pileus), covered with long, soft, hairy filaments.

PIPSHAPED, (of spores), shape of an apple seed.

PITTED, (of pileus or stem), similar to lacunose; with little depressions.

PITH, (of stem), the soft tissue in the interior, which often disappears so that the stem becomes hollow.
PLANE, (of pileus), with a flat surface.
PLIANT, not rigid nor firm; easily bent.
PLICATE, (of pileus), plaited; folded like a fan.
PLUMBEOUS, (color), like lead.
PLUMOSE, finely feathery.
POROSE, (of hymenophore), approaching the condition of possessing pores.
POSTERIOR, (of gills), behind, toward the stem.
PRAEMORSE, (of the "root" or base of stem), as if broken off abruptly.
PROLIFEROUS, (of stem), producing other stems on itself near the base.
PROTEAN, exceedingly variable.
PROTOPLASM, the living semifluid substance of the cells which is the basis of life.
PRUINATE, same as pruinose.
PRUINOSE, (on the surface), as if finely powdered.
PSEUDOPARENCHYMA, the tissue of fungi when its cellular structure imitates the parenchyma of higher plants.
PSEUDOPROSENCHYMA, tissue of fine elongated hyphae, somewhat resembling the prosenchyma of higher plants.
PUBESCENCE, a covering of short, soft, downy hairs.
PUBESCENT, provided with pubescence.
PULVERULENT, covered as if with powder.
PUNCTATE, (of pileus or stem), dotted with minute scales or other substance.
PUTRESCENT, soon decaying and becoming soft and mushy.
PYRIFORM, (of cystidia or cells), pear-shaped.
PYRAMIDAL, (of scales), pyramid-shaped.
QUADRATE, (of spores), angularly four-sided.
RADICATING, (of stem), imitating a root.
RAMIFICATION, branching.
REFLEXED, (of margin of pileus), turned up or back.
REMOTE, (of gills), free and at some distance from the stem; (of annulus), at some distance from apex of stem.
RENIFORM, (of pileus), kidney-shaped.
REPAND, (of pileus), wavy on margin and turned back or elevated.
RESUPINATE, (of pileus), with the upper surface reclining on the substratum, the gills facing outward.
RESUPINATE-REFLEXED, (of pileus), attached for some dis-

tance by the back surface, the other portion extending out like a shelf.

RETICULATE, (of pileus or stem), marked by lines, veins or ridges which cross one another as in a net.

REVIVING, said of a fruit-body which shrivels in dry weather and takes on its natural shape when wet.

REVOLUTE, (of margin of pileus), rolled back or up.

RHIZOIDS, radiating hyphae extending into substratum from base of stem.

RHIZOMORPHS, visible strands or cords of compacted mycelium, often dark colored, penetrating a soft substratum or between portions of it, as between bark and wood, etc.

RIMOSE, (of pileus), cracked.

RIND, same as cortex.

RING, same as annulus.

RIVULOSE, (of pileus and stem), marked with lines like a river-system on a map.

ROOTING, (of stem), an attenuated prolongation into the soil or substratum.

ROUND-BULBOUS, of a bulb not marginate.

RUFESCENT, (color), becoming reddish.

RUFOUS, (color), reddish, dull red.

RUGOSE, coarsely wrinkled.

RUGULOSE, finely wrinkled.

SACCATE, (of cystidia), shape of a meal-bag.

SANGUINEOUS, (color), blood-red.

SAPROPHYTE, a plant which lives on dead vegetable or animal matter.

SCABROUS, (of pileus), rough with short, rigid projections.

SCALES, applied to various decorations on the pileus and stem; torn portions of the cuticle or of the universal veil or of the volva; they may be membranous, fibrillose, hairy, floccose, hard, erect, flat, patch-like, etc.; often an important feature for identification.

SCALY, provided with scales.

SCLEROTIA, resting-bodies of small size, composed of a hardened mass of hyphae, from which fruit-bodies may develop.

SCISSILE, (of flesh of pileus), capable of being pulled into horizontal layers; this condition is most marked in a hygrophanous pileus.

SECEDE, (of gills), when at first attached to stem, i. e. adnate or adnexed, but separating from it later.

SECONDARY SPORES, not borne on basidia; conidia, chlamy-

dospores, etc.; formed directly on the mycelium or on hyphae of the fruit body.

SEPARABLE, (of cuticle, pellicle, etc.), not adnate.

SEPARATING, see secede.

SERICEOUS, silky.

SERRATE, (of gills), with saw-tooth-like edge.

SERRULATE, minutely serrate.

SERRATULATE, same as serrulate.

SESSILE, (of pileus), without a stem.

SETACEOUS, (of stem), bristle-form.

SHAGGY, rough with long compact fibrils.

SILKY, covered with shining, close-fitting fibrils.

SINUATE, (of gills), a concave indentation of its edge near the stem.

SINUOUS, wavy, serpentine.

SLENDER, (of stem), very long as compared to its thickness; relative to stout.

SMOOTH, (of spores), not spiny, tuberculate, rough, nor angular, etc; (of pilus and stem), see glabrous.

SOLITARY, not growing in the immediate neighborhood of other individuals.

SOLID, (of stem), not hollow nor stuffed; of a texture in its central axis similar to that found in the rest of a cross-section.

SORDID, (color), dirty or dingy.

SPADICEOUS, (color), date-brown.

SPATHULATE, (of pileus), spatula-shaped; oblong with attenuated base.

SPECIES, the lowest term in classification; a group of individuals agreeing in certain characters which appear again in their progeny; one species differs from another in several marked characters agreed upon as sufficiently specific by tradition or by specialists in the group; a species is therefore a judgment, and has limitations imposed by an agreement of the judgments of scientific men. One or more species with certain common characters constitute a genus.

SPECIFIC, referring to characters which are used in designating or distinguishing species.

SPHAGNUM, a genus of mosses; bog-moss.

SPINY, (of spores), strongly echinulate.

SPHOEROID, (of spores), nearly spherical; similar to spherical.

SPONGY, (of stem), soft and tending to be water-soaked.

SPONGY-STUFFED, (of stem), with a spongy pith.

SPORE, the reproductive cells in Agarics borne four on each basidium; more accurately called basidio-spores. In other cryptogams the term is applied to reproductive cells or bodies of a great variety of kinds. The basidio-spores when they germinate give rise to mycelium.

SPOROPHORE, fruit-body.

SPURIOUS, false.

SQUAMOSE, (of pileus or stem), covered with scales.

SQUAMULOSE, minutely squamose.

SQUAMULE, scale.

SQUARROSE, (of pileus and stem), covered with recurved scales.

STAINED, said of any part which appears as if some coloring matter had been spilled on it and spread on the surface.

STALK, an indefinite term for stem, pedicel, etc.

STELLATE, (of spores, scales), with extensions like that of a star.

STERIGMA, the tiny spicule-like extension at the apex of a basidium on which the spores develop.

STERILE, said of a fruit-body or hymenium which is immature or produces no spores; or simply, without spores.

STERILE CELLS, term applied in this report to the slender cells on the edge of gills which bear no spores and which cause the fimbriate appearance of the edge as shown under a lens.

STIPE, technical term for the stem of mushrooms; see stem.

STIPITATE, possessing a stem.

STOUT, (of stem), relative to slender; not so many times longer than thick.

STRAIGHT, (margin of pileus), when not incurved.

STRAMINEOUS, straw-color.

STRIATE, (of margin of pileus), radiating minute furrows or lines; (of stem), longitudinal lines or minute furrows.

STRIAE, the lines or furrows when striate.

STRIGOSE, (of pileus or stem), with coarse or thick, long, rather stiff hairs.

STUFFED, (of stem), when the axis is filled with a differentiated pith which usually disappears in age leaving it hollow.

SUB—, prefix signifying "almost," "somewhat" or "under."

SUBGENUS, a term in classification; a grouping under a genus and containing groups of related species. The subgenera of the mycologists of one generation are often raised to the rank of genera by later students.

SUBICULUM, a more or less dense felt of hyphae covering the substratum, from which the fruit-bodies arise.

SUBDISTANT, (of gills), the spacing halfway between close and distant.

SUBDECURRENT, (of gills), when the attachment extends slightly farther down the stem than when adnate.

SUBHYMENIUM, a differentiated tissue just beneath the hymenium.

SUBSTRATUM, the substance in or on which the fungus grows, as soil, humus, fallen leaves, dung, wood, animal remains, etc. A better term than matrix.

SUBULATE, awl-shaped.

SULCATE, (of pileus and stem), grooved, more extreme than striate, less so than plicate.

SUPERFICIAL, (of scales, flocci, etc.), on the surface and easily removable.

SUPERIOR, (of annulus), attached above the middle of the stem.

SYNONYM, the name or names of a species or genus no longer tenable, either because of error in naming, rearrangement of the classification or as a result of "rules" promulgated by scientific men acting in agreement. Many of the long known plants have a number of such synonyms.

TAN, (color), leather-colored, similar to undressed leather; isabelline.

TENACIOUS, tough.

TERETE, (of stem), round like a broom-handle, not irregular.

TERRESTRIAL, growing on the ground.

TESTACEOUS, (color), brick-red.

TEXTURE, the arrangement of the components of the different tissues, as compact, loose, etc.

TINGED, with a tint of a color.

TISSUE, an aggregate of similar cells or hyphae.

TOADSTOOL, same as mushroom; popularly applied to those about which the user of the term often has no knowledge and which he therefore considers poisonous; a large number of so-called "toadstools" are edible.

TOMENTOSE, (of pileus or stem), densely covered with a matted wooliness or tomentum.

TOMENTUM, composed of long, soft, entangled or matted fibrils.

TOXIC, poisonous.

TOOTH, (of gills), decurrent by a tooth; see uncinate.

TRAMA, the fleshy portion of pileus or gills composed of hyphae.

TRANSLUCENT, capable of transmitting light without being transparent.

TRANSVERSE, cross-wise.

TREMELLOID, of a gelatinous consistency.

TRUNCATE, an enlarged portion ending as if cut off.

TUBERCLE, any wart-like or knob-like excrescence.

TUBERCULATE, (of spores), covered with minute tubercles.

TUBERCULAR-STRIATE, (of pileus), when the striae are roughened by small tubercles.

TUMID, (of stem), swollen, inflated.

TURBINATE, (of pileus), top-shaped.

TYPE, the original specimen or specimens from which the species was described and named.

TYPICAL, agreeing with the descriptions of the type or with the type itself.

UMBER, (color), almost tobacco-colored; see Saccardo's Color Key.

UMBILICATE, (of pileus), with a central, naval-like depression.

UMBILICUS, a naval-like depression.

UMBO, (of pileus), a raised, conical to convex knob or mound on the center.

UMBONATE, (of pileus), provided with an umbo.

UNCINATE, (of gills), provided with a narrow, decurrent extension at the stem.

UNDULATE, same as wavy.

UNEQUAL, (of gills), of different length, some reaching the stem, others shorter.

UNEVEN, (of pileus or stem), said of surfaces with striations, reticulations, tubercles, etc.; not even.

UNICOLOROUS, of the same color throughout.

UNIVERSAL VEIL, sometimes used for volva.

VAGINATE, (of stem), provided with a long volva or sheath at the lower end.

VARIABILITY, the state of being variable.

VARIABLE, capable of taking on a number of different shapes, forms, colors or other characters, while retaining its specific identity.

VARIEGATED, marked with a variety of colors, which are intermingled.

VARIETY, (a). Here used to refer to a form which a species constantly assumes, under definite conditions, e. g. climate, soil, artificial culture, etc. Such forms are often given names, as *Psalliota compestris* var. *hortensis*.

(b). Also used to designate forms which are not typical, but which are not sufficiently known to be designated by a specific

name; such are given the name of the nearest species in this report followed by the abbreviation "var."

(c). When a variety is found to be constant in its characters and always distinct in some such characters from other species, it should eventually be given a specific name, but in rare varieties such constancy is not easily proven.

VEIL, see "partial veil," "universal veil," "cortina" and "volva."

VEINED, (of gills), with vein-like wrinkles or raised lines on the surfaces.

VELUM, see veil.

VENOSE, same as veined.

VENTRAL, on the under side of, opposed to dorsal.

VENTRICOSE, (of stem), swollen or enlarged in the middle.

VERRUCOSE, warty.

VERRUCULOSE, minutely warty.

VESICULOSE, referring to the trama of the Lactariae. See page 83.

VILLOSE, covered with long, soft, weak hairs.

VINACEOUS, (color), of the color of red wine.

VIOLACEOUS, (color), of some violet hue.

VIRESCENT, (color), becoming greenish.

VIRGATE, (of pileus), streaked, usually by differently colored fibrils.

VISCID, sticky.

VISCOUS, gluey.

VITELLINE, (color), egg-yellow.

VOLVA, the universal veil of certain genera. See pages 4 and 593.

WARTY, (of pileus, spores, etc.), covered by small wart-like excrescences.

WAVY, (of margin of pileus), alternately raised and depressed like waves.

WAXY, (of gills), of a consistency that can be partially or wholly moulded or compressed into balls.

ZONATE, (of pileus), marked with concentric bands of color.

ZONED, same as zonate.

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